Metals Review

The News-Digest Magazine

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February 1958

W. Hume-Rothery
Honorary Member A.S.M.
(See Article, p. 4)

Metals Review
The News Digest Magazine

February 1958
Vol. XXXI, No. 2

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio: G. M. Young, President; C. H. Lorig, Vice-President; R. H. Aborn, Treasurer; W. H. Eisenman, Secretary; G. A. Fisher, Carl E. Swartz, John Hollomon and H. H. Stansbury, Trustees; D. S. Clark, Past President. Subscriptions $5.00 per year ($6.00 foreign). Single copies $1.00. Entered as Second Class Matter, July 26, 1930 at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers from overseas, or because of failure to notify the circulation department of a change of address or because copy is "missing from files".

Important Lectures

Departments

ASM Review of Metal Literature

DR. HUME-ROTHERY IS NOMINATED HONORARY MEMBER A.S.M.

The Board of Trustees of the American Society for Metals nominated to Honorary Membership William Hume-Rothery, professor, department of metallurgy, Oxford University, England. Unfortunately, Dr. Hume-Rothery was unable to be present at the banquet meeting during the National Metal Congress and Exposition in Chicago in November 1957, when the formal presentation was made. However, Anthony Post, assistant secretary of the Iron and Steel Institute, London, was present to receive the award for Dr. Hume-Rothery.

Past President A.S.M., Bradley Stoughton, read the citation which nominated Dr. Hume-Rothery to Honorary Membership and presented Mr. Post. The citation was as follows:

"Dr. Hume-Rothery has been a pioneer and a leader in the development of a scientific basis for the traditionally empirical arts of metallurgy. He has demonstrated, by means of a monumental amount of experimental and theoretical work, and in collaboration with numerous colleagues and students who thereby achieved scientific maturity, that the phase diagrams of alloy systems could be understood, and even predicted, in terms of the sizes of the atom, their electron contribution to the alloy.

"His many writings, aimed at all levels of scientific sophistication, have led to a rapid acceptance of the idea that a scientific approach to the understanding of metals would be industrially and intellectually rewarding.

"The science of metals owes a great debt to the skill, determination and scientific insight of Hume-Rothery".

Dr. Hume-Rothery was born in Worcester Park, Surrey, England, in 1899, and educated at Cheltenham College, the Royal Military Academy, Woolwich, Magdalen College at Oxford and the Royal School of Mines. He received his doctor of science from the University of London. He was recently named first Isaac Wolfson Professor of Metallurgy at Oxford University, and he holds fellowships in many British scientific associations. He was an annual lecturer for the American Institute of Mining and Metallurgical Engineers in 1946 and is the holder of the Beilby Memorial Award. He is a fellow in the Royal Society, the Chemical Society, the Institute of Physics and the Institute of Metallurgists.

Plans for First Western Welding, Brazing, Heat Treating Conference Set

The first announcement of the First Western Welding, Brazing and Heat Treating Conference, sponsored by the **Golden Gate Chapter,** has been mailed to 3115 members of the A.S.M. chapters in the 11 western states. The Conference will be held Mar. 27-28, 1958, at Stanford Research Institute, Menlo Park, Calif.

The Conference is shaping up well, with eight of the proposed speakers now confirmed. These speakers are top men in their fields, and the Golden Gate Chapter considers itself fortunate to have them on the program.

L. F. Yntema, retired vice-president and director of research, Fansteel Metallurgical Corp., will discuss problems in welding of high-temperature and unusual metals; E. H. Edwards, corrosion and materials engineer, Standard Oil Co. of California, will speak on corrosion resistant materials for petroleum and chemical processes; A. T. Cape, consulting metallurgist, Los Angeles, will discuss brazing problems in the aircraft and missile industries; H. E. Lewis, partner and general manager, Pyromet Brazing and Heat Treating Co., will cover joining and heat treating of difficult metals for specialized fields; R. E. Lorentz, director of research, Combustion Engineering Co., will talk on welding, joining and heat treating problems in the fabrication of nuclear power plant equipment; W. J. Erichsen, manager, metallurgical department, Westinghouse Electric Co., and chairman of the Golden Gate Chapter, will present the welcome address; and R. H. Thielemann, chairman, metallurgical research department, Stanford Research Institute, will present the luncheon address on Mar. 27.

This Conference has received favorable comment from metallurgical and welding people in the West, and has created a good deal of interest for publishers of technical journals with both West Coast and national coverage.

The registration fee, including the banquet and two luncheons, will be $20. There will also be a ladies tour of Stanford University, *Sunset Magazine* and of San Francisco, conducted over a period of two days. It is expected that many attendees will be accompanied by their wives and will follow the Conference with an enjoyable weekend in San Francisco. It is suggested that registration be made well in advance for this Conference as advance information indicates a record attendance from all over the West.—**Report by R. C. Bertossa, Chairman of the First Western Welding, Brazing and Heat Treating Conference.**

—A Mightier World Through Metallurgy—

Photoreproduction Service On Articles Abstracted For Machine Searching

Starting in January 1958 a substantial portion of the articles abstracted in the A.S.M. Review of Metal Literature are being simultaneously encoded for machine searching. Both abstracting and machine encoding operations are performed at the Center for Documentation and Communication Research at Western Reserve University, where the A.S.M. is currently sponsoring a $75,000 five-year pilot plant experiment to determine the feasibility of machine searching of metallurgical literature. The project is now close to the half-way mark, with nearly 10,000 abstracts or articles analyzed and encoded for search, using the experimental searching selector built at Western Reserve University.

During the first two years of the project informative abstracts taken from various sources were used as raw material. Starting in 1958 it has been decided to consolidate the abstracting and machine searching operations and prepare both types of abstracts direct from current literature.

The abstracts which are encoded for machine searching are identified in *Metals Review* by an asterisk immediately following the serial number and preceding the title of the paper. About 400 articles a month will be chosen for such treatment; they will be those judged most important from the standpoint of future reference work and lasting value.

Photoreproduction Service

These encoded abstracts will be preserved on punched paper tape and on punched cards, and will form the nucleus of a machine searching library about which will eventually be built a complete A.S.M. "Metals Information Center". **At the same time the original articles from which the abstracts were prepared will also be preserved. To accommodate A.S.M. members and others who do not have access to original documents, a limited photoreproduction service is being the title will be available for**

Prices and procedures have not yet been completely worked out but will be announced in the March issue of *Metals Review*. Only the articles marked with an asterisk just preceding the title will be available for such reproduction.

Describes Radiation Damage in Metal

R. Maddin, University of Pennsylvania, Presented a Talk on "Quenching Effects and Radiation Damage in Metals" at a Meeting of Northwestern Pennsylvania. Shown are, from left: O. Ehlers, program chairman; Dr. Maddin; G. E. Mohnkern, chairman; and J. G. Hoop, technical chairman

Speaker: R. Maddin
University of Pennsylvania

"Quenching Effect and Radiation Damage in Metal" was the subject of a talk given before the **Northwestern Pennsylvania Chapter** by R. Maddin, director of the school of metallurgical engineering, University of Pennsylvania.

Dr. Maddin first pointed out that radiation damage in metals occurs as the result of many high-energy particles such as neutrons, electrons, gamma rays, etc. He then limited his discussion to the effects of neutron bombardment. Radiation damage occurs when a neutron strikes the nucleus of an atom and, being absorbed by the nucleus, either changes the characteristics of the atom, or displaces the atom. Such a displacement was described as a "primary knockout" which, occurring at very high energy, causes "secondary knockouts". This dispersion of the energy of the neutron was described as a "cascade" which results in a very great increase in temperature in the area where it occurs. However, it was pointed out that this temperature rise is dissipated in about 10^{-9} seconds.

The change in physical properties of metals, as a result of these actions, was then surveyed. Dr. Maddin pointed out that certain observations are yet unexplained. It has been observed that grain growth is a result of irradiation of metals, which has been particularly observed in uranium. The creep rate of metals is also affected. Another effect is an increase in hardness and a rise in brittleness. A significant rise in the yield strength and a flattening of the stress-strain curve have also been observed. Dr. Maddin commented that there is also an effect on the corrosion properties of metals but that these have been studied very little and appear to be quite complicated. Irradiation also changes the transition temperature.

It was pointed out that annealing after irradiation partially or wholly restores metals to their original condition, but that some of this is quite difficult and must be done at high temperatures.

Comparison of the known effects of quenching of metals with the observed effects of irradiation was used to explain how theories of the changes in atomic structure have been verified. Among the better known similarities are the increases in hardness and yield strength. Dr. Maddin, in describing an experiment, introduced a term, new to many, "quenching up", which led to his defining quenching as a sudden change in temperature.

Dr. Maddin's discussion was well illustrated with slides and by his use of the blackboard. He frequently referred to various investigations made in the field and directed interested persons to the available literature.—**Reported by R. C. Schreffler for Northwestern Pennsylvania.**

Describes Advantages of Radioisotopes at Saginaw

Speaker: O. M. Bizzell
Oak Ridge National Laboratory

Some 1700 licensed industrial organizations are saving $400 million annually by the use of radioisotopes, according to O. M. Bizzell, chief of the Isotopes Development Section, Division of Civilian Application, Oak Ridge National Laboratory, in a talk on the "Availability and Industrial Utilization of Radioisotopes" given before the **Saginaw Valley Chapter.**

The three methods of measuring isotope activity in materials—reflection, attenuation and emission—were described and illustrated by the speaker.

In the metallurgical research field, temperatures, diffusion rates, alloy composition, surface area and wear properties can be measured by radioactive materials. Radioisotopes are also proving a valuable tool in routine high-speed inspection work. Thickness gages, liquid level detection and radiography are some of the processes utilizing this new method.

Mr. Bizzell mentioned a number of beneficial effects that can be achieved through the use of radioisotopes, including increased hardness of structural material, improved properties of semiconductors and increased activity of catalyst.

Mr. Bizzell stated that the Atomic Energy Commission is desirous of extending the application of radioisotopes to the industrial field. At present it licenses firms, trains personnel and advises on safety precautions.—**Reported by William C. Cole for Saginaw Valley.**

Compliments

To J. B. AUSTIN, vice-president, research and technology, U. S. Steel Corp., and past president A.S.M., (1954-55) who was chosen by The Franklin Institute to deliver the first William B. Coleman Lecture before the Institute. Dr. Austin will talk on "Basic Research—Foundation of Steel's Progress Today". Mr. Coleman was past president A.S.M. (1933)

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To THOMAS G. FOULKES, who has been chosen by the Lehigh Valley Chapter to receive its annual Bradley Stoughton Award. Mr. Foulkes is metallurgical engineer for the Bethlehem Steel Co.

Outlines Heat Transfer Principles

"Heat Transfer in Industrial Heating and Cooling" Was the Topic of M. H. Mawhinney, Consulting Engineer, at Rockford. Shown, from left: Joseph Sisti, program chairman; Fire Chief Swanson, coffee speaker; D. A. Campbell, chairman; Mr. Mawhinney; and W. F. Ross, who introduced the speaker

Speaker: M. H. Mawhinney
Consulting Engineer

M. H. Mawhinney, consulting engineer for Crucible Steel Co. of America and other steel companies, spoke on "Heat Transfer in Industrial Heating and Cooling" at a **Rockford** meeting.

The metallurgist and the heat transfer engineer must work together in the treatment of metals since they are both affected by a multiplicity of apparently contradictory factors. At present, understanding of each for the other's problems is not as good as it should be for the best cooperative effort. Historically, furnace building as anything approaching a science probably began with the first edition of W. Trink's book on the subject in 1923, in which he gave two rules which have caused much confusion from lack of understanding.

One was that the steel can be heated *X* min. per in. of diameter or thickness, and the other, that furnaces of diffrent types can be operated at *Y* lb. per hr. per sq.ft. of hearth area. The metallurgist in general grasped the first rule and the furnace builder the other, with much resulting conflict because the two rules say two different things when not fully understood. Heat is transferred in one or more of three ways—conduction, convection and radiation—and, in a heating furnace, all three methods are present and each is dependent upon a number of factors which were described in charts by Mr. Mawhinney. He illustrated the principles of high-speed heating which result from a low value of the ratio R, which represents the area of metal divided by the area of refractory in the furnace, in all designs, with symmetrical application of radiant heat and with high-temperature gradients.

The results in many cases have surprised the metallurgist and necessitated some revision of opinion regarding the rates at which steel can be heated without damage.

Aluminum heating was contrasted with steel heating and this was shown on charts. A chart illustrated heating in liquid baths; heat transfer in a relatively still liquid is primarily by conduction, which is affected by the insulating effect of conditions at the interface between the liquid and the solid. The rate of transfer is greatly accelerated by movement where convection applies, as in many continuous operations, such as wire and strip galvanizing and annealing, and to baths of lead, zinc, tin, salts and similar liquids.

Two distinct types of cooling are encountered in metallurgical work. One is the forced cooling of metal in the open, such as the cooling of strip before entering the pickle bath to prevent quench buckling. The other cooling is in an enclosure, as in an atmosphere furnace, to prevent discoloration from contact with the outside air. Cooling is accomplished by radiation and convection and by the evaporation of finely divided water or fog.

The slowest cooling is in a brick-lined chamber but, by the addition of air-cooled pipes, speed is increased. Relative cooling rates were described for wind tunnels, aerofin coolers, water jackets, air pipes and brick enclosures.—**Reported by G. W. Sandstrom for Rockford.**

Young Is Guest in Pittsburgh

Shown at the National Officers Night Meeting Held by the Pittsburgh Chapter Are, From Left: Kent R. Van Horn, Technical Chairman; President G. M. Young, Who Spoke on the "Extrusion Process"; Secretary W. H. Eisenman; and Lester C. Hill, Chairman. Since Mr. Young will present this same talk before many chapters this year, it will not be reported here

Alan Levy (Center), Supervisor, Materials and Process Group, Marquardt Aircraft Co., Who Spoke on "Performance of Materials at Elevated Temperatures for Aircraft and Missile Applications" at Albuquerque, Is Shown With Douglas Ballard, Chairman (Left), and C. Maak, Technical Chairman

Talks on High-Temperature Performance

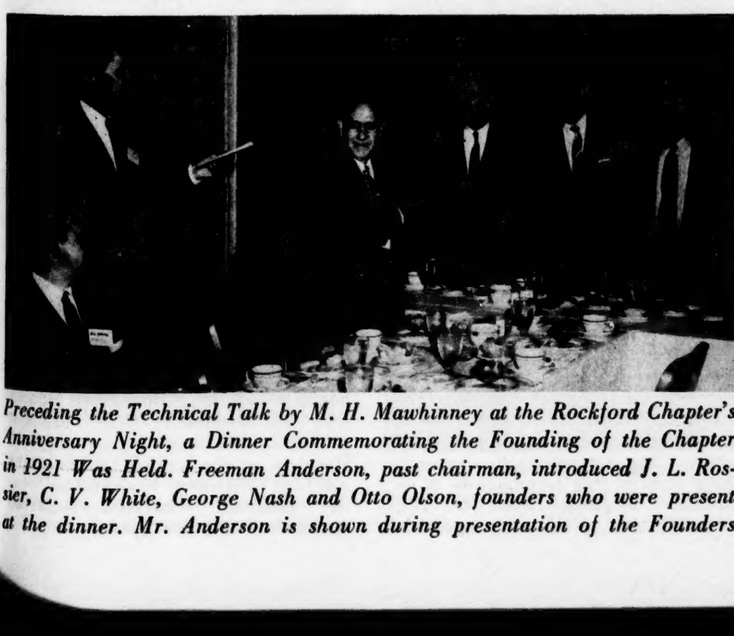
Speaker: Alan V. Levy

Marquardt Aircraft Co.

Alan V. Levy, supervisor, Materials and Process Group, Marquardt Aircraft Co., spoke on the "Performance of Materials at Elevated Temperatures for Aircraft and Missile Applications" at **Albuquerque.**

The application of materials in structures subjected to high temperatures requires an extensive knowledge of proposed service conditions and material properties. Several factors which do not have to be considered in room temperature conditions affect the selection of materials for high-temperature applications. Mr. Levy listed the following: method and rate of application of loads as they vary with temperature; sources and distribution of heat; total service time at each temperature and load condition; variation in material strength with temperature; variation in modulus of elasticity; oxidation characteristics; coefficient of expansion with attention to differential expansion between components; thermal conductivity, surface emissivity and metallurgical stability of materials at high temperatures. Most of the common structural materials as well as the high-temperature alloys can be used at elevated temperatures. Aluminum and magnesium alloys, alloy steels, stainless steels and high-temperature alloys all have distinct areas of usage. Mr. Levy discussed the application of these alloys, presenting a wealth of data including short time tensile properties up to 2400° F. For steady-state use, he feels that molybdenum alloys will open up a new temperature area. The melting point of materials is not a barrier, or even a thermal thicket. It is an impassable wall to be scaled by cooling rather than passed through. However, applications within the capabilities of uncooled, structural metals and refractories will always exist.

At the brief business session, Douglas W. Ballard, the present chairman, presented a certificate of recognition to Robert S. Lemm, past chairman, for his outstanding service. Bob in turn presented a certificate to Douglas W. Grobecker, past program chairman, for his energetic leadership in promoting the highly successful symposium on "Heat Tolerant Metals for Aerodynamic Applications" held last January. Both retiring officers praised the members for their support and close teamwork, which have resulted in a fast-growing chapter and top-rate technical speakers for the coming year.—**Reported by C. A. Scott for Albuquerque.**



Preceding the Technical Talk by M. H. Mawhinney at the Rockford Chapter's Anniversary Night, a Dinner Commemorating the Founding of the Chapter in 1921 Was Held. Freeman Anderson, past chairman, introduced J. L. Rossier, C. V. White, George Nash and Otto Olson, founders who were present at the dinner. Mr. Anderson is shown during presentation of the Founders

Founders Are Recognized at Rockford

Discusses Vacuum Melted Alloys

"Vacuum Melted High-Temperature Alloys" Were Described by Frank M. Richmond, Universal-Cyclops Steel Corp., at a Recent Meeting Held in Boston. Shown, from left, are: J. L. Martin, technical chairman; Neil Hartley, Massachusetts Institute of Technology, coffee speaker; and Mr. Richmond

Speaker: F. H. Richmond
Universal-Cyclops Steel Corp.

Frank M. Richmond, manager of materials research, Universal-Cyclops Steel Corp., presented a talk on "Vacuum Melted High-Temperature Alloys" at a meeting held recently by the **Boston Chapter.**

Although there are numerous laboratory melting techniques involving the use of vacuum, only three of these —vacuum degassing, induction vacuum melting and consumable electrode vacuum arc melting—are currently being used commercially. Of these, the vacuum degassing technique is the least restricted in size since the actual melting operation does not take place under vacuum. The primary effect of this process is to greatly reduce the hydrogen content when the heat is cast in vacuum. This reduction in hydrogen has been proven to practically eliminate "flaking" in large rotor forgings. At the present time Universal-Cyclops is casting 11-ton ingots of various toolsteels, stainless steels and superalloys by this technique to determine if these materials are similarly benefited.

Vacuum induction melting (Inductovac), in which the entire melting and casting operation takes place under vacuum (less than 10 microns), results in the greatest total degassing of all of the commercial vacuum techniques, substantially lowering the hydrogen, oxygen and nitrogen content. This process has been used largely for the production of nickel-base superalloys where it has resulted in greatly improved forgeability of such alloys and has permitted increased alloying concentrations of titanium and aluminum. It also allows such alloys to be melted without the use of manganese and silicon as deoxidizing elements. These chemistry changes, together with the very important additions of minor amounts of boron and zirconium, have resulted in significant improvements in high-temperature strength and ductility. Similar chemical modifications in air-melt alloys can produce equivalent high-temperature properties but greatly complicate the melting and fabrication of the air-melt materials. There is no doubt that the Inductovac process results in a much cleaner material of greatly reduced gas content than air melting. This process is somewhat restricted in size, however. The largest such furnace now in operation has a capacity of 2400 lb., and a 5000-lb. furnace is planned for installation in 1958. Two 2000-lb. vacuum induction furnaces are now in operation at the Bridgeville plant of Universal-Cyclops.

The consumable electrode vacuum arc melting process (Duomelt) requires the preparation of an electrode by standard air-melting practices. This electrode is remelted under vacuum by the consumable electrode technique into a water-cooled copper mold. This remelting under vacuum results in a reduction in gas content intermediate between the vacuum degassing and vacuum induction process. Its major advantage is the improved ingot structure which results from the controlled casting operation. This control permits the casting of quite large ingots of grades which normally present many difficulties due to excessive shrinkage and segregation tendencies. The largest ingot currently being cast by this technique is 26 in. diameter, weighing 12,000 lb. Universal-Cyclops is now casting 20-in. ingots and has a furnace capable of producing ingots 40 in. in diameter, weighing 29,000 lb. There is theoretically no size limit to this process.

It is possible to combine the advantages of the Inductovac and Duomelt process by preparing the electrode by vacuum induction rather than air melting. This procedure (Duovac) results in the lowest possible gas content, the greatest freedom from nonmetallic inclusions and the best ingot structure possible by commercial melting techniques. Commercial sized ingots of nickel-base superalloys are currently being prepared by this technique at Universal-Cyclops' Bridgeville plant.

Mr. Richmond used numerous slides and a short movie on vacuum melting to illustrate his talk.—**Reported by J. B. Savits for Boston.**

—Better Metals for a Brighter Tomorrow—

Birmingham Completes a Course on Welding Metals

The annual educational lecture series sponsored by the **Birmingham Chapter** covered the general topic, "Welding Metallurgy". The text used was Metals and How to Weld Them, published by the James F. Lincoln Arc Welding Foundation.

In the first lecture of the series, Charles B. Reymann, supervisor, materials laboratory, Hayes Aircraft Corp., spoke on "Welding Nonferrous Metals". He discussed the general application of metallurgy to the welding of nonferrous metals, particularly aluminum.

The second lecture of the series was on "Welding Metallurgy of Stainless Steels" by G. E. Claussen, laboratory division head, Newark Development Laboratory, Linde Co.

John E. Durstine, district manager, Lincoln Electric Co., gave the third lecture on "Avoiding Welding Problems With Welding Metallurgy". He discussed the application of metallurgy to the welding of carbon and low-alloy steels as related to operator training, electrode selection, welding sequence, joint preparation, preheating and post heating.

The final lecture was held in conjunction with one of the chapter's regular meetings. H. C. Waugh, International Nickel Co., Inc., spoke on "Welding of Ductile and Gray Irons". —**Reported by Robert Fisher for Birmingham.**

—Civilization Chronicles Our Progress in Metals—

Texas Hosts Ladies

Members of the **Texas Chapter** heard a talk on "Citizenship Education" by Charles F. Hiller, dean of the Junior College, University of Houston, at the annual Ladies Night meeting. Wesley Kuenemann was the program chairman.—**Reported by M. C. Lucky for Texas.**

Overseas Conferees Guests of Cleveland Chapter

Guests of Cleveland Chapter at a Meeting During Which W. M. Baldwin, Jr., Case Institute of Technology, Spoke on "New Dimensions in Metal Testing" Were Members of World Metallurgical Congress Tour Six on Inspection and Testing of Materials. Chairman Charles H. Campbell is shown at extreme right

Speaker: W. M. Baldwin, Jr.

Case Institute of Technology

William M. Baldwin, Jr., research professor, department of metallurgical engineering, Case Institute of Technology, described "New Dimensions in Metal Testing" at a meeting of the **Cleveland Chapter.** Several members of the 2nd World Metallurgical Congress Tour Six on the Inspection and Testing of Materials were guests at the meeting.

The new "dimensions" which must now be considered in order to correlate laboratory tests with actual service conditions or commercial forming operations are the variables of testing speed, temperature, prestrain and surface embrittlement or notching.

It was shown how materials with superior tensile properties failed to react to forming operations as favorably as did other materials with lesser tensile properties. In this case the question of testing speed was of importance, since forming speeds are high and tensile test speeds are relatively low.

Dr. Baldwin discussed how, in heading operations, in addition to the effects of testing speeds, prestrain was encountered as a variable. It was determined that the more prestrain that was introduced the less was the resulting ductility in a tensile test; also the more pre-compression, or "pre-squashing", the more improved was the tensile ductility (to a point). It followed that prepulling of wire or bar during normal cold working operations raised the heading limit of these materials. Therefore it was explained why cold finished, or cold worked stock presented better forming characteristics than its annealed counterpart when testing speeds were held constant.

Temperature is also considered an important variable or dimension. It has been demonstrated how ductility and magnetic properties of certain steels are affected by low temperatures. Interesting slides were shown which illustrated the relationships of temperature, testing speeds and ductility over wide ranges of both temperature and testing speed.

Surface embrittlement and its effects upon standard tests were also discussed. It was pointed out that standard carburized and nitrided cases, as well as electroplated coatings, may make a material notch sensitive. In the instance of SAE 1340 steel, a case depth of 0.001 in. results in a 50% decrease in ductility. Some materials are exceedingly notch sensitive and care must be taken to assure that standard test specimens are free of marking. As the depth of notches increased the formability of these materials decreased greatly.

The fact that these new variables affect the results and the interpretation of standard tests is readily apparent. The limits and restrictions of standard testing techniques are now realized, and it is now possible to more accurately predict the behavior of metals in service through understanding of these new dimensions.—**Reported by J. R. Shepard for Cleveland.**

Calumet Members Tour Tin Mill

A Few of the 80 Members of the Calumet Chapter Who Were Guests of the Youngstown Sheet and Tube Co. for a Conducted Tour Through the Company's Tin Mills During a Recent Meeting. (Reported by E. F. Dudley)

Metallurgical News and Developments

A Department of *Metals Review*, published by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio

Devoted to News in the Metals Field of Special Interest to Students and Others

New Sales Outlet — Nordson Corp., formerly Bede Products Corp., has announced the establishment of a new Eastern sales and service outlet at 477 Bergen Blvd., Ridgefield, N. J. Named Nordson Eastern Sales, Inc., the new company will function as sales and service center for all Nordson Corp. products.

Materials in Combination—Recently developed co-extrusion techniques have enabled the fabrication of many combinations of metals in the form of tubing, rods and special shapes. Seamless copper tubing, clad inside and out with zirconium, is one of the products now available for advanced design and specialized purposes. Additional core materials include mild steel, aluminum and molybdenum, clad metals, stainless steel, titanium, platinum and others. Samples and Information Bulletin No. 10 are available from: New Development Dept., Nuclear Metals, Inc., 224 Albany St., Cambridge 39, Mass.

Liquid Abrasive—A machine using a liquid abrasive process to give a microscopically smooth finish to aircraft, missile and automotive components has been developed by Lewis Welding & Engineering Corp. The machine features an automatic method of handling parts during the abrasive process and a new type of oscillating air-blasting gun which is fed by an infinitely variable pump. The liquid abrasive or "slurry" is supplied to the gun in any predetermined mixture.

New Mill—Somers Brass Co., Waterbury, Conn., has announced installation of one of the largest Sendzimir mills ever built for the nonferrous industry. With this new facility, Somers can supply thin strip down to 0.001 in. and as wide as 25 in.

Changes Name—Harvey Machine Co., Inc., has changed its corporate name to Harvey Aluminum. Ownership, corporate structure, management, operations and controls remain unchanged.

Develops Process — A process for electroplating copper on aluminum strip and aluminum wire has been developed by Sylvania Electric Products Inc. The process permits plating of aluminum strip in widths up to 10 in. and in thicknesses from 0.008 to 0.050 in. Thickness of the copper plating ranges from a flash coating to 0.002 in. per side.

Completes Facilities—Latrobe Steel Co. has expanded its branch office and warehouse activity in the Toledo area with the completion of a new, modern building located at 1230 Expressway Dr.

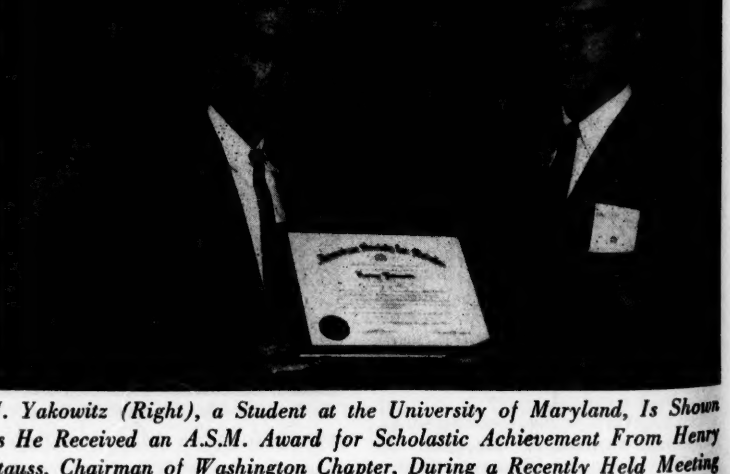
Thin Strip—An ultra-thin composite strip designed for high-temperature and high - frequency applications where miniaturized components are mandatory is now in production by the American Silver Co. The metal is silver-clad-on-copper and is precision rolled in all thicknesses down to foil gages, to thickness tolerances as close as ± 0.0001 in.

Opens Sales Offices — Magnethermic Corp., Youngstown, Ohio, has announced the opening of district sales offices to replace manufacturers' representatives in Chicago, Cleveland, Philadelphia and Pittsburgh.

Consolidate — Engelhard Industries, Inc., a consolidation of nine American companies in the precious metals and precision manufacturing fields, has been announced. The company's products include atomic-reactor components, nuclear instruments, aircraft and missile parts, dental and medical devices, and equipment for the petroleum, chemical, pharmaceutical, plastics, automotive, jewelry, ceramics and electrical industries.

Epoxy-Alloy—Bakelite Co., a division of Union Carbide Corp., has announced the development of a plastic-metal composition based upon an epoxy resin system reinforced with metal or glass fibers and metal fiber flocking. This material and process innovation, known as Epoxy-Alloy, permits runs up to 150,000 stampings where low-gage softer metals are to be formed.

Student Receives A.S.M. Award



H. Yakowitz (Right), a Student at the University of Maryland, Is Shown as He Received an A.S.M. Award for Scholastic Achievement From Henry Stauss, Chairman of Washington Chapter, During a Recently Held Meeting

MEN OF METAL

R. P. MOSLEY, former customer service representative, Electrode Division, Great Lakes Carbon Corp., is now sales representative in the Houston territory. He is succeeded by H. T. THOMPSON, former development chemist in the technical department. WILLIAM G. MCFADDEN of the Morgantown, N. C., plant, is now sales office manager of the Electrode Division's headquarters in New York.

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Alloy Precision Castings Co., Cleveland, recently promoted FRANK W. GLASER general manager, to vice-president in charge of operations for the West Coast parent firm, Mercast Corp. MICHAEL GLADSTONE, former sales manager, is now general manager, and WALTER POREMBA, who has held various executive positions in foundries in the Cleveland area, is now sales manager for Alloy Precision Castings Co., with headquarters in Cleveland.

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JOHN M. FEELY, in charge of sales in the New England area, has been appointed sales manager by Dixon Corp., to be responsible for nation-wide sales of Dixon products.

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JAMES KING, JR., is now sales manager of electrode products for National Carbon Co. Headquarters are in New York City, and he will report directly to F. B. O'Mara, marketing manager.

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R. DENNISON COURSEN, deputy director, has been appointed director of the Malayan Tin Bureau in Washington, to fill the vacancy created by the retirement of the former director LYNN W. MEEKINS.

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A. D. DAUCH has been appointed vice-president in charge of foreign sales for Salem-Brosius, Inc., Pittsburgh. He will be in charge of all foreign sales, except Canadian activities, which will be handled directly by Salem Engineering, Ltd., Toronto. W. T. BOSWORTH, formerly assistant to the vice-president of sales, is sales manager and F. C. FRAME is now assistant sales manager.

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L. P. CONSTANZO is district sales manager for the New England sales office, Wethersfield, Conn., recently opened by Peterson Steels, Inc.

Outlines Developments in Materials

Program Chairman Julius Harwood (Left), Is Shown Presenting a Certificate of Appreciation to N. E. Promisel, Navy Department, Who Spoke on "New Developments in Materials" at a Meeting Held by Washington Chapter

Speaker: N. E. Promisel

Navy Department
Bureau of Aeronautics

N. E. Promisel, head of the Materials Branch and chief metallurgist, Bureau of Aeronautics, presented a talk on "New Developments in Materials" at a meeting of the **Washington Chapter.**

Mr. Promisel emphasized the importance of new material concepts motivated by aircraft, missile and rocket requirements but suitable for much wider fields of application.

Before discussing these developments, Mr. Promisel stated that the more obvious and merely difficult advances in material developments have already been achieved, and that future technical breakthrough in materials would require a degree of basic understanding coupled with ingenuity, initiative, perseverance, uninhibited thinking, logic, time and effort of a magnitude far greater than ever before.

After discussing new tools such as vacuum melting, electron gun melting, extrusion molding and ultrasonic welding, the broad picture of material development was presented. This was keyed to operations over a broad temperature spectrum beginning with the low-density elements, beryllium, magnesium and aluminum.

Recent emphasis in the titanium field has been on development of high - strength, high - temperature (800° F.) alloy sheet material. This is a part of a major Department of Defense program which is well advanced in meeting its high target requirements. Further interesting possibilities have been developed for alloys with room temperature tensile strength approximating 200,000 psi., with significant progress in the extrusion and casting of titanium alloys. Exploitation of high-strength, light-weight titanium fasteners has begun.

Mr. Promisel further expanded his talk by presenting information on alloys such as Thermenol and transformation and precipitation hardening steels of the 17-7 PH and AM 350 type.

The development of ultra-high strength steels with tensile strengths in the vicinity of 300,000 to 400,000 psi. was discussed. It was stated that tool and die steels with about 5% chromium offer good promise at both room and elevated temperatures.

The need for materials above 1500° F. and extending to 5000° F. was explained. Some of the highest temperatures anticipated occur on long-range guided missiles, after re-entry into the atmosphere at speeds of 10,000 to 20,000 mph. Jet engine blades, however, are currently used below 2000° F. High stresses, long operating times, and criticality of dimensions make this application one of the most difficult to satisfy.

Three major approaches to breaking through the thermal limitations were discussed, namely, development of chromium-base alloys, refractory-base alloys and cermets. Molybdenum was indicated as one of the most promising refractory alloys, with the major remaining problem being the perfection of coatings to resist oxidation under severe conditions encountered in some applications. New facilities for processing molybdenum and other environment sensitive materials at very high temperatures, in inert atmospheres, were described.

Mr. Promisel concluded with a discussion of composite materials such as fiber-reinforced metals and metal compacts. This composite material field is considered vital as it offers a still largely unexploited approach to the solution of many of the material problems confronting us.—**Reported by Roy M. Gustafson for Washington.**

A.S.M. spends $44.50 to service each member of the Society for a period of one year.

At Chicago's Metal Fabricators Night

Principals at the Metal Fabricators Night Held by Chicago Chapter Included, From Left: Joseph A. Kubik, Stewart-Warner Corp., Technical Chairman; P. G. Nelson, The Budd Co., Who Spoke on "Deep Drawing"; B. S. Myers, Chairman; K. J. Trigger, University of Illinois, Who Spoke on "Cutting Tool Wear"; and Elliot Nachman, La Salle Steel Co., Technical Chairman

Speakers: K. J. Trigger and P. G. Nelson

Metal Fabricators' Night meeting held by the Chicago Chapter featured discussions on "Deep Drawing" by P. G. Nelson, The Budd Co., and "Cutting Tool Wear" by Kenneth J. Trigger, professor of mechanical engineering, University of Chicago.

Mr. Trigger covered the mechanism of tool wear including the role of temperature and its distribution. Results of research studies were presented for both crater and flank wear along with the fundamental reasons for wear phenomena.

Some of the causes given for cratering were temperature and temperature distribution, sliding contacts and strain. Most of the work was done with single-point tools. A slide showing a crater and how it formed illustrated the fact that cratering forms in back of the cutting point.

Mr. Nelson discussed the mechanics of drawing of metals, materials and the tools used. The different types of deformation encountered in the forming of metals were also covered.

The speaker pointed out that while the Rockwell hardness tester and the Olsen cup test are the common tests performed to determine the formability of material for deep drawing, other tests, such as elongation under maximum load, a true stress-strain curve, or yield point elongation, frequently are much better guides.

Careful record keeping can be the greatest aid in determining whether a material will perform as expected. Too often, due to lack of time or personnel, insufficient records are kept. Records, not only as to material, but also as to the type of dies and the performance of these tools under various conditions, should be kept. These records can be of great help when new designs are engineered.—**Reported by H. W. Orth for Chicago.**

New Films

Colorado Fuel and Iron Corp.

The Colorado Fuel and Iron Corp., P. O. Box 1920, Denver 2, Colo., has announced the availability of a booklet describing its 14 sound-color motion pictures which cover various aspects of mining, steelmaking and the manufacture of finished steel products. All of the films are 16-mm. and have running times of from 15 to 38 min. Write to the company for full information.

The Corporal Story

A motion picture of the development and test firing of the Army's rocket-powered, surface - to - surface guided missile, the Corporal, and what this new weapon means to America's defense is available through Association Films, Inc., 347 Madison Ave., New York 17, N. Y.

Illustrate Oil Well Metallurgy

H. A. Johnson (Left), Byron Jackson Division, Borg-Warner Corp., and W. S. Althouse (Right), Baker Oil Tools, Inc., Spoke at a Meeting in Los Angeles. They are shown with John S. Goodwin, technical chairman of the meeting

Speakers: W. S. Althouse H. A. Johnson

Members of the **Los Angeles Chapter** viewed an interesting film covering oil well drilling, cementing and completion practices during a recent meeting. The film described why cementing is required and showed the many different types of cementing jobs which could be required to complete a modern oil well. It was produced jointly by the University of Texas and the Oil Well Drillers Association.

W. S. Althouse, chief engineer, Baker Oil Tools, Inc., described the "down hole" tools used in the process of making a well productive. These tools, which must operate effectively below ground under severe conditions, create many problems in metallurgy and design. Some of these tools are made from drillable materials which can be disintegrated "down hole" rather than retrieved.

H. A. Johnson, metallurgical engineer, Byron Jackson Division, Borg-Warner Corp., described some of the equipment used above ground, pointing out that these tools are usually made from alloy forgings and castings.

Some of the larger parts were described, such as the hooks and elevators, which are rated as 500-ton tools. Inspection requirements are rigid on parts as critical as these, both through manufacture and later while in use.

A foundry problem, known as "Rock Candy" was described, along with many of the reasons for this poor structure in some steel castings. —**Reported by T. J. Simms for Los Angeles Chapter.**

Vacuum Melting Methods Described at Buffalo

Speaker: E. Skalka

Crucible Steel Co. of America

Vacuum melting of metals, a laboratory curiosity before World War II, is now firmly established as a tonnage operation. This phenomenal growth has been the result of technological progress in equipment and the recognition of the improved quality obtainable with this process. In his discussion of "Vacuum Melting" before the **Buffalo Chapter,** Ed Skalka, Crucible Steel Co. of America, indicated that there were five major segments of the vacuum metals program, namely, ladle degassing, stream degassing, vacuum casting, vacuum induction melting, and vacuum consumable electrode melting.

Each of the above procedures has a specific industrial use affecting both properties and price in very specific areas. In general, ladle degassing, stream degassing and vacuum casting produce better properties through the elimination of the dissolved gases in the molten metal. Vacuum induction melting and vacuum consumable electrode melting tend to eliminate segregation as well as gas in the finished product. Elimination of gas improves soundness, surface finish and mechanical properties. Other advantages of vacuum melting are the elimination of slag, improved workability of the ingot, closer chemical control and possibility of adding reactive alloying elements.

Associated with these inherent advantages from a chemical control standpoint are the recognized facts that elimination of hydrogen reduces embrittlement, elimination of nitrogen reduces the tendency of austenite stabilization and also tends to improve fatigue life, and elimination of oxygen tends to lower the transition temperature of the basis alloy.

In vacuum melt metals the fatigue stress is proportional to the tensile strength over all strength levels (from 100 to 300,000 psi.). As is well known, this is not true with air melt materials. In air melt, the ratio of fatigue strength to tensile strength drops as tensile strength is increased. Similarly, transverse ductility of vacuum melt metals is approximately equal to longitudinal ductility whereas, in air melt material, transverse ductility may vary from ½ to ⅓ the value of the same material in a longitudinal direction.

Mr. Skalka emphasized that vacuum melting is not a cure-all and that the price increase associated with vacuum melt metals currently restricts application but where unique properties are needed, vacuum melting may be the most economical process to be used for that material. **—Reported by G. F. Kappelt for Buffalo Chapter.**

Defines Brittle Fractures in Metals

C. H. Lorig (Center), Technical Director, Battelle Memorial Institute, and Treasurer A.S.M., Spoke on "Brittle Fractures" at a Meeting of the Rocky Mountain-Denver Chapter. He is shown with Jim Blackledge, Denver Research Institute (left), and Floyd Anderson, Gardner-Denver Co. (right)

Speaker: C. H. Lorig

Battelle Memorial Institute

C. H. Lorig, assistant director, Battelle Memorial Institute, and national treasurer A.S.M., spoke recently at the **Rocky Mountain Chapter** on the subject of "Brittle Fractures".

Dr. Lorig gave the chapter members a brief look into the future planned by A.S.M. The proposed new national headquarters building was described. It will be the first building of the scientific center to be located in the area. The contents of the new edition of the Metals Handbook, which will contain enough additional information to justify the publication of five separate volumes, was outlined. In addition, Dr. Lorig told of the Metals Engineering Institute courses now being offered, and the newer courses being completed. The A.S.M. goals were summarized by the word "growth" and Dr. Lorig predicted that these goals would be reached only by enthusiasm, planning, expansion and progress by all A.S.M. members.

Dr. Lorig began his technical discussion of brittle fractures with a brief reminder of the epidemic of brittle failures which occurred during the early 1940's on the all-welded liberty ships. These failures led to the first concentrated investigations of the factors surrounding brittle failures. In spite of the intense research and development programs since, the mechanisms of brittle fracture are still not fully understood.

Brittle fractures are defined as those in which deformation occurs only in the area of failure while ductile fractures are those in which deformation occurs over the entire stressed area. Brittle failures usually have their origin around sharp notches and depend upon the rate of loading and the stress concentrations present at high loads. The failure mechanism has been linked to atomic structure, dislocations, and the outer electron configurations of the base metal, alloys, and impurity elements. The face-centered cubic metals, such as aluminum, alpha iron, lead and copper, do not seem to become embrittled, while the body-centered cubic metals, such as gamma iron, chromium, molybdenum and tungsten, are susceptible to embrittlement. The ductile-to-brittle transition temperatures are normally evaluated by keyhole notch impact tests.

Proper design can decrease possibilities of brittle fractures. One of the main metallurgical variables in structural grade steels is the carbon and manganese content of the material. As carbon is increased, the transition temperature is increased, while the addition of manganese tends to decrease the transition temperature. The additions of silicon and aluminum will also depress the transition temperature, while a coarse grain size will tend to increase the brittle temperature range. Another parameter is the selection of the proper microstructure with a quenched and tempered structure being the toughest from the impact standpoint. Also briefly discussed were the English series of ND (notch ductile) steels with manganese-to-carbon ratios of approximately eight and with additions of silicon and aluminum.

In conclusion, Dr. Lorig re-emphasized the effects of proper design and also pointed out that service behavior is one of the best criteria of good design. A recommendation for future work is to broaden the correlations between laboratory tests and behavior under actual service conditions.**—Reported by L. G. Loseke for Rocky Mountain-Denver.**

Meet Your Chapter Chairman

CLEVELAND

CHARLES H. CAMPBELL, research project engineer with American Steel & Wire Division, U. S. Steel Corp., was born in Munhall, Pa. He holds a B.S. degree in metallurgy from Pennsylvania State University and an M.A. degree from Case Institute of Technology. After college he started with his present company as an observer at the Cuyahoga Works and progressed through different positions until assuming the position he now holds.

Mr. Campbell, a member since 1934, has served on his chapter's executive committee for several years, was secretary and treasurer and chairman of the program, finance and directory committees. He has a daughter, Marilyn, and two sons, Richard and Paul.

Spare-time interests include photography, music, electronics, tennis and metalworking.

CHICAGO

BRALY S. MYERS, supervisor, materials research, chemistry and engineering materials research, International Harvester Co., studied metallurgy at Vanderbilt University and received B.S. and M.A. degrees from Peabody College with majors in chemistry.

Before taking his present position he was head of the chemistry department of Northwest College, process engineer at Consolidated Vultee Aircraft Corp., and chief metallurgist of the parts division, Reynolds Aluminum Co.

Mr. Myers has been on his chapter's executive committee for three years, chairman of handbook committees and he is a member of other societies, including the American Electroplaters Society and the American Society for Testing Materials. He was also an American conferee to the Second World Metallurgical Congress.

He and his wife Millie have a daughter Gayle, 21 years old, and son Chip, who is 15. He enjoys golf, fishing and goose hunting.

WILMINGTON

In the spring of 1956, as chairman of organizational committees set up to stimulate interest in a new chapter, JAMES E. MCNUTT was active in forming the Wilmington Chapter from the Philadelphia Chapter.

After he acquired his B.S., M.S. and Ph.D. degrees in metallurgical engineering from Carnegie Tech., he was an engineer at N.A.C.A. in Cleveland, then technical secretary, committee on ship steel, National Research Council, before taking his present position as research engineer, Engineering Research Laboratory, E. I. du Pont de Nemours & Co.

Mr. McNutt is a member of several technical societies, enjoys bridge, chess and fresh-water fishing. Daughter "Katie" is approaching two years of age.

INLAND EMPIRE

THOMAS J. SUMMERSON is research chemist in the department of metallurgical research, Kaiser Aluminum & Chemical Corp. Born in Spokane, he is a graduate of Whitworth College, with a B.S. degree in chemistry, and he holds an M.S. degree in physical chemistry from the University of Idaho, where he was on a research fellowship. He has specialized in corrosion problems since college and was appointed light metals correspondent, for a three-year term, with N.A.C.E.'s *Corrosion Magazine*.

During World War II Mr. Summerson served 14 months in the U. S. Army Signal Corps. He has been chairman of the Chapter's attendance and recepition committees and was secretary and treasurer for two years.

He and his wife Susan have a daughter, Lynda, eight years old, and a son, Mark, who is one. He enjoys hunting and fishing when he can find time for these activities.

BUFFALO

CHARLES W. HART, chief metallurgist, Republic Steel Corp., Buffalo District, has been with this company since graduating from Lehigh University in 1937, with the exception of six years spent in the armed forces, one year in Army Ordnance, and five years as ordnance officer with the Air Force. He is now in the active reserve with a commission as lieutenant colonel. He is a member of a number of service clubs and is past chairman of the Niagara Frontier Section, A.I.M.E., and has been vice-chairman and treasurer of Buffalo Chapter A.S.M.

Mr. Hart enjoys golf, photography and "do-it-yourself" projects.

LOUISVILLE

F. F. DIETSCH, a native of Grand Rapids, Mich., has a B.S. degree in chemical engineering and metallurgical engineering from Michigan State University. Soon after leaving the University he joined the U. S. Navy and was attached to the Bureau of Aeronautics, Navy Department, Washington, D. C., to head the nonferrous metallurgy section of the metallurgical branch. Shortly after being released to inactive duty as a lieutenant commander, he joined Reynolds Metals Co. and was technical service engineer in the Louisville, Kansas City divisional and Washington executive offices. He later transferred to Louisville as supervisor of government specifications, a position he held until assuming his present position as project director in the product development department.

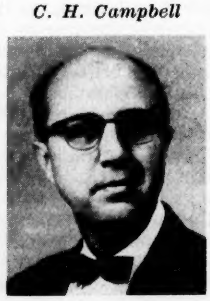
Mr. Dietsch has been a member of the executive committee for the past three years and served as vice-chairman in 1956. He is a member of the Kentucky Society of Professional Engineers and A.S.T.M.

He and his wife, Marjorie, have one son and three daughters. His sparetime interests are carpentry, swimming and fishing.

T. J. Summerson

C. W. Hart

C. H. Campbell



J. E. McNutt

F. F. Dietsch

Gives Toolsteel Talk in St. Louis

E. E. Lull (Center), Crucible Steel Co. of America, Gave a Talk, "A Toolsteel Worker's Omnibus", at a Meeting of St. Louis Chapter. He is shown with Chairman R. D. Bardes (left), and George Fisher, A.S.M. trustee

Speaker: E. E. Lull
Crucible Steel Co. of America

A recent meeting of the **St. Louis Chapter** started off with an interesting tour of Emerson Electric Co., where the die casting process and details of the manufacture and assembly of electric motors were examined. Later, a talk, "A Toolsteel Workers' Omnibus", was presented by F. E. Lull, assistant manager of toolsteel division, Crucible Steel Co. of America.

Mr. Lull combined his experience in metallurgy with practical observation to make an interesting talk. Heating and cooling of steels as regards expansion and contraction because of thermal and phase changes were discussed.

The problem of change of shape, so complex that it is unlikely that a new die can be made to the final size required, was described. The practical answer is to allow enough stock for clean-up after heat treatment. Decarburization produces layer material variations that act differently as regards expansion and contraction. This problem can be handled by allowing stock for removal of the variable decarburized zone on the hot rolled bar. Machining stresses influence warping, but can be handled by adequate stress relieving practice before final machining. The cost of this insurance is low, compared to the benefits. Tempering of toolsteels is a function of time and temperature. The heat treat shop cannot be hurried if results are to be optimum. Design plays an important part in the usage of tools. Resistance to deflection cannot be improved by a simple change in composition or increase in hardness. An increase in cross section will handle this problem.—**Reported by Gerhard Ansel for St. Louis.**

Gives Production Aspects Of Nitriding at Peoria

Speaker: Horace C. Knerr
Metlab Co.

Horace C. Knerr, president, Metlab Co., and a long-time member A.S.M., talked on "Metallurgical and Production Aspects of Nitriding" at a meeting of the **Peoria Chapter.**

Mr. Knerr compared the characteristics of various case hardening processes with relation to nitriding. One great advantage of the latter is that a hard case is obtained without quenching, so that the usual causes of deformation are eliminated. This, in turn, avoids costly corrective grinding operations and the tendency to burn and crack carburized cases.

Nitriding consists in heating steels of suitable composition in an atmosphere of ammonia gas to a temperature of from 975 to 1000° F., holding for the desired penetration and allowing to cool in the furnace. Time varies according to case depth but 72 hr. at heat is good commercial practice and gives a case of 0.020 in Nitralloy steels. Economy results from running large loads at one time.

Preheat treated stock is used or the parts are heat treated by oil quenching and tempering in the rough or semifinished state. It is important to remove all surface decarburization and eliminate residual stresses.

The alloys chromium and molybdenum are essential. The addition of 1% aluminum gives a superhard case (C 62-67) characteristic of the steels known under the trade name of "Nitralloy". SAE 4140 and 4340 give an excellent case about 50% deeper, and much tougher than that of Nitralloy, but less hard (C 50-55). These steels are being used to an ever increasing extent in hundreds of commercial applications where extreme resistance to wear and a minimum of deformation are necessary. The nitrided case retains hardness up to 800 to 1000° F. and there is no tendency to seize or gall.

The "white layer" in nitriding, ordinarily about 0.002 in. thick, is considered by some to be detrimental in excess of 0.0005 in. The Floe or duplex process has been developed to so limit it. The Metlab Co. has nitrided many hundreds of tons of Nitralloy as well as 4140 and 4340 steels by conventional methods, and has never run into difficulties directly traceable to the white layer. The case of Nitralloy steels is so hard as to inevitably be brittle, but the 4140 and 4340 steels with an 0.002 in. white layer will withstand severe hammer blows on a sharp edge without chipping, cracking or spalling.

Mr. Knerr showed numerous slides illustrating mechanical properties of nitrided steels, equipment used and a variety of parts, including large gears, long rolls, cams, dies, molds, etc., successfully nitrided.—**Reported by M. W. Mericle for Peoria Chapter.**

Correction

On p. 17 of the December issue of *Metals Review,* George A. Fisher, International Nickel Co., and a national trustee of the American Society for Metals, was incorrectly referred to as a past trustee. Mr. Fisher's term as trustee will not be up for another full year. Sorry George!

Deductible Income Tax Expense

The Internal Revenue Service, under ruling 55-4, I.R.B. 1955-1, states that a taxpayer "who gives his service gratuitously to an association, contributions to which are deductible" under the relevant provisions of the Code and "who incurs unreimbursed traveling expenses, including the cost of meals and lodging while away from home in connection with the affairs of the association and at its direction, may deduct the amount of such unreimbursed expenses in computing his net income"; subject, however, to the limitation in respect to all gifts made to exempt organizations, such as A.S.M.; namely, that the total amount of such gifts made in any one year may not exceed 20% of the donor's gross income for such year. This limitation means that while such expenses are deductible they are included with other gifts in computing the 20% limitation.

Welding Problems On T-1 Steel Topic At Birmingham

Speaker: Perry C. Arnold

Chicago Bridge & Iron Co.

At the annual joint meeting of the **Birmingham Chapter** and the Birmingham Section of the American Welding Society, Perry C. Arnold, chief field welding engineer, Chicago Bridge & Iron Co., described "Problems Associated With Welding of T-1 Steel" and discussed the tests undertaken to solve these problems.

These difficulties were encountered during the field erection of two spherical pressure vessels 110 ft. x 6 in. diameter made of 0.73 thickness T-1 material. The design stress was 32,400 psi., the working pressure 71.1 psi., and the vessels were pneumatically tested at 88.9 psi. Each of these vessels, storing approximately 3,500,000 cu-ft. of manufactured gas, were fabricated in the U. S. and field erected by Ishikawajima Heavy Industries, Tokyo, under the supervision of the speaker's company.

Engineers and metallurgists have known for many years that excellent toughness can be secured from quenched and tempered material. They have been reluctant to use this material extensively due to difficulties in joining the sections by welding. This tough material can be readily welded with several low-hydrogen electrodes now on the market if the metallurgical properties are given due consideration and the correct welding procedure is used.

Mr. Arnold emphasized that, to date, no trouble has been encountered with the T-1 material, but only with the weld metal. The trouble appeared in the form of transverse cracking in weldments made in the field under conditions of high restraint and unfavorable weather conditions.

Since the cracking problem in Tokyo did not become serious until the first circumferential joint was welded, it was felt that the high restraint from joining large sections together was a contributing factor. A test plate was welded together in a restraining jig using the E12016 electrode. The plates were welded in the horizontal position; that is, the plate itself was kept in a vertical plane with the axis of the weld horizontal. This position was chosen because it gave maximum cracking in Tokyo. The test plates were welded without preheat with an interpass temperature of 75°F. with the electrodes in the as-received condition but stored continuously in a drying oven at 300 to 400°F. except at time of use. This procedure reproduced the transverse cracking experienced at Tokyo.

This test plate was sectioned through the center of the weld and the longitudinal surfaces were macro-etched. Not only were transverse cracks, shown by X-ray examination, but many small fissures or microcracks were present. It is believed that large transverse cracks are extensions of the microfissures. These microfissures cannot be found by radiography. They can also be present in a weld without the accompanying visible transverse cracks. It was found that the fissures always originated and were normally contained in the heat affected zone in the weld metal resulting when a weld bead was placed on top of another weld bead.

Weld specimens were made under high restraint with electrodes that had been baked to remove moisture from the coating, an interpass temperature of 75°F., and no preheat. Only a few microfissures were evident. The next variable added was the use of a moderate preheat along with the rebaked electrodes.

Many tests were made in all positions to prove that the use of the rebaked electrodes and a preheat of over 150°F. completely solved the fissuring and cracking of the weld metal. This procedure was then applied to the welding of the spheres in Tokyo and the cracking of the weld metal was completely eliminated.

Unrestrained test plates welded with almost any of the high-strength electrodes would satisfactorily pass the requirements of Section IX of the A.S.M.E. Code; however, several welding variables could not be evaluated with these tests. The Navy explosion bulge test was used to study the performance of the weldments under shock and plastic loading, and to particularly evaluate the effect of the microfissures and small cracks that might be present in the weld that could not be detected by radiographic examination. The explosion tests showed that these microcracks do not seriously affect the weldment performance.

Since T-1 steel is a quenched and tempered material, consideration must be given to the welding procedure used so that it will not impair the tensile and toughness properties of the steel. If too high a preheat is used, some portion of the heat affected zone may be tempered sufficiently to lower the tensile strength. It is also possible that the impact strength of this zone might be impaired.

Mr. Perry supplemented his talk with slides showing the erection of the spheres, the restrained test plate jigs, macro-etched surfaces of the weld specimens, photomicrographs of fissures, explosion test plates and other test data. He also showed color slides of downtown Tokyo and other points of interest of his trip to Japan. —**Reported by Robert Fisher for Birmingham.**

IMPORTANT MEETINGS *for March*

Mar. 11-13—Instrument Society of America, Pittsburgh Section. Annual Conference on Instrumentation of the Iron and Steel Industry, Roosevelt Hotel, Pittsburgh. (Frank K. Briggs, Secretary, Atomic Power Division, Westinghouse Electric Corp., Large, Pa.)

Mar. 12-14—Pressed Metal Institute. Annual Spring Technical Meeting, Sheraton-Cadillac Hotel, Detroit. (Harold Daschner, Managing Director, 3673 Lee Rd., Cleveland 20, Ohio.)

Mar. 17-18—Steel Founders' Society of America. Annual Meeting, Drake Hotel, Chicago. (F. Kermit Donaldson, Executive Vice-President, 606 Terminal Tower, Cleveland 13, Ohio.)

Mar. 17-21—National Association of Corrosion Engineers. Annual Conference and Exhibition, Civic Auditorium, San Francisco. (A. B. Campbell, Executive Secretary, 1061 M & M Bldg., Houston 2, Tex.)

Mar. 17-21—Nuclear Congress and Atomic Industry Trade Show. International Amphitheatre, Chicago. (International Atomic Exposition Inc., 12 S. 12th St., Philadelphia 7, Pa.

Mar. 26-28—American Hot Dip Galvanizers Association. Annual Meeting, Penn-Sheraton Hotel, Pittsburgh. (Stewart J. Swensson, Secretary, 1806 First National Bank Bldg., Pittsburgh 22, Pa.)

Tri-City Is Briefed on Metallurgical Progress

Speaker: A. Gray

Steel Magazine

In his address on "Metallurgical Progress" before the **Tri-City Chapter,** Allen Gray, technical editor of *Steel Magazine,* stated that the metallurgical problems of today are more difficult than those that will be encountered during the age of space travel. The fundamental problem today is the development of alloys to withstand the heat generated by atmospheric friction, which will be virtually absent in space travel. Recent materials developed for this purpose are chromium-molybdenum stainless steels and titanium, molybdenum and columbium alloys. In atomic energy applications, not only are radioactive elements important, but also the metals that let us use them, such as zirconium, boron and beryllium.

Other new methods discussed included vacuum melting, vacuum degassing, photo-etching, chemical milling and honeycomb construction. Dr. Gray pointed out that while most of these methods were developed for nuclear or missile applications, they will be of greater value when applied to our general manufacturing fields. —**Reported by Jack Peck for Tri-City Chapter.**

Gas Turbine Requirements Noted

Robert F. Thomson, Head, Metallurgical Engineering Department, General Motors Corp. Research Staff, Spoke on "Automotive Gas Turbine--Metallurgical Needs" at a Meeting of Jackson Chapter. Shown, from left: C. J. Stiles, technical chairman; Dr. Thomson; and C. R. St. John, chairman

Speaker: R. F. Thomson
General Motors Corp.

Robert F. Thomson, head, metallurgical engineering department, Research Staff, General Motors Corp., presented a talk entitled "Automotive Gas Turbine -- Metallurgical Needs" at a meeting at **Jackson.**

Dr. Thomson explained the difference between the two turbine power plants, the combustion turbine engine and the free-piston engine, both of which major automotive producers are investigating. From a metallurgical aspect, the combustion turbine operates at a temperature range of about 1500° F. and has highly stressed turbine blades. The free-piston engine operates at a temperature range of from 600 to about 850° F. The fuel economy of this engine appears possibly competitive with the reciprocating engine.

The combustion turbine engine generally will require oxidation resistant and high-strength materials. Considerable progress will have to be made in lower alloy, more heat resistant steels, according to Dr. Thomson. These materials are not yet a reality and even promising materials appear to be initially expensive and more expensive to fabricate and process than materials for either the reciprocating or free-piston engine.

Dr. Thomson showed on slides that the material cost per pound for the combustion turbine engine would at the present time exceed that used in the reciprocating engine.

In conclusion, Dr. Thomson stated that the new power plants are in their infancy and it is somewhat early to compare these prototype results with those of a highly developed article. In fact, comparisons are not easy to make because of the difficulty of obtaining a common basis of comparison. The automotive turbine will find its place initially in specialized applications; at present these appear to be in heavy-duty commercial vehicles and in military uses, where distinct performance advantages can be demonstrated which may well overshadow any cost disadvantages which exist.—**Reported by W. F. Stewart for Jackson.**

OBITUARIES

F. Floyd Harter

F. Floyd Harter, district manager of Universal Cyclops Steel Corp., Hartford, Conn., died in December. Mr. Harter had been identified with the steel industry for nearly 50 years, having been with Crucible Steel Corp. in Syracuse, N. Y., for 18 years previous to coming to Hartford. He served 28 years as district manager for Universal Cyclops until his retirement in 1956.

Richard K. West

Richard K. West, head of West Instrument enterprises was lost early in December while flying his company plane over Lake Erie. Prominent in the development of the firm bearing his family name, Mr. West had presented papers and authored articles on instrument applications which have become widely used. He was president of West Instrument Corp. of Chicago and chairman of West Instrument Ltd. of England.

Reports on Use of Aluminum in Aircraft

Eugene Bauer, Boeing Airplane Co., Spoke on "Utilization of Aluminum Alloys in the Manufacture of Aircraft" at a Recent Meeting Held by Puget Sound Chapter. Present were, from left: J. W. Sweet, vice-chairman; Mr. Bauer; C. B. Holder, chairman; and H. L. Southworth, secretary-treasurer

Speaker: Eugene Bauer
Boeing Airplane Co.

The technical speaker at the recent meeting of the **Puget Sound Chapter** was Eugene Bauer, metallurgist for Boeing Airplane Co., who spoke on "Utilization of Aluminum Alloys in the Manufacture of Aircraft".

Mr. Bauer discussed how the aluminum alloys came into existence as material for airframe construction. He pointed out the close parallel between the development of aluminum alloys and the growth of airplanes in size and performance.

The historical development was based on the growth and development of the Boeing Airplane Co. which is representative of the growth of the aircraft industry. Mr. Bauer carefully traced the development of Boeing airplanes from the first plane built in 1916, which contained no aluminum, to the KC 135, which has a 66% aluminum airframe.

With the development of the high-speed military bombardment and interceptor airplanes, the aluminum alloys will drop out of the picture since the skin temperature will be above 300° F. However, there will still be applications for aluminum alloys in some missiles where flight time is extremely short.

Mr. Bauer anticipates that future commercial airplanes will be operating at speeds of 1500 mph. At this speed the structural portion of the airplane, including the external skin, will not be operating above 300° F. Apparently, by 1975, airline passengers will be riding in aluminum fuselages, carried by aluminum wings.

A question period followed Mr. Bauer's informative talk.—**Reported by J. E. Kamitchis for Puget Sound.**

Metallic Coating Processes Explained

C. H. Sample, Electroplating Section, International Nickel Co., Inc., Discussed "Metallic Coatings for Corrosion Protection" at a Meeting Held by Northwestern Pennsylvania Chapter. Shown, from left: Walter C. Struchen, reporter and membership chairman; G. E. Mohnkern, chairman; Mr. Sample; Michael J. Lucas, program chairman; and Otto Ehlers, vice-chairman

Speaker: C. H. Sample

International Nickel Co., Inc.

At a meeting held by the **Northwestern Pennsylvania Chapter**, C. H. Sample, Electroplating Section, International Nickel Co., Inc., spoke on "Metallic Coatings for Corrosion Protection". The talk was well illustrated with appropriate slides.

Mr. Sample first described the types of coatings used for all kinds of corrosive conditions, describing each group by the manner in which it is deposited. He included hot dipped, sprayed, cementation-type, metallurgically clad, electrodeposited, electroless and heat reduced coatings.

He further described electronegative coatings and electropositive coatings, which are based on electrochemical relationships to basis metal.

Experiment has shown that the plated steel bright work on the exterior of automobiles will retain its decorative value over a longer period of use if the plate includes a liberal thickness of nickel deposited directly on the steel or over a copper undercoat. The nickel thickness is the important factor. A two-layer coating of nickel is the best for marine and rural atmospheres. Plating by chemical reduction will not supplant electroplating. Its chief advantage is in applications where the shape is complex. This method is called the Kanigen process and can be used, because of its uniform build-up, where very close tolerances are to be met.

In the Niphos process an oxide of nickel is reduced on the coated surface at a temperature much lower than the melting point of either the base metal or nickel. The basic ingredients of this coating mixture are inexpensive (nickel oxide, dibasic ammonium phosphate, and water), and they are combined to a paste, paint or spray consistency. One pound of this raw material coats about 25 sq. ft. area to a thickness of 0.001 in. This process is both fast and practical and is simple to apply.

Mr. Sample stated that the problem of corrosion resistance is under constant study. The study programs are continuous and cover long periods of time before positive conclusions can be drawn.—**Reported by Walter C. Struchen for Northwestern Pennsylvania Chapter.**

—The Gleam of Metal Brightens the Future—

Springfield Talk Deals With Failures in Metal

Speaker: Sidney Low

Chapman Valve Manufacturing Co.

Sidney Low, director of research, Chapman Valve Manufacturing Co., spoke on "Analysis of the Failure of Metals" at a meeting in **Springfield**.

Mr. Low introduced his topic by stating that all failures fall into three categories: chemical, thermal and mechanical. Many failures are due to people and not metals. An example here might be poor basic design of the product by engineers. The speaker recalled an experience whereby the complex investigation of a magnesium retort weld failure brought out the fact that a modern detergent used in cleaning the part had been the culprit. The detergent contained sulphur which, in this case, caused catastrophic oxidation.

Some other common causes of failure mentioned were segregation, soundness, voids, lead in zinc-base die castings, decarburization due to heat treatment and grain growth. The lack of heat treating, such as tempering, or quenching after tempering, brittle failures due to carbon precipitation, or improper case hardening of steels, are kindred causes. Failure can also be caused by faulty welding techniques or by corrosion.

One of the most unfortunate causes of failure is due to poor communications on the part of the sales department which transmits the customer's product requirements, where faulty orders can result in poor design to begin with since loading of parts or temperature data is service information which both the designer and metallurgist must know.

Mr. Low pointed out the need for a good library when dealing with the analysis of failures. Several notable reference works dealing with studies of failures were mentioned.

Logical reasoning is not to be taken for granted but must be practiced during evaluation of failure. X-ray diffraction is a useful tool to determine elements or composition in any failure, but close visual inspection of the failure as it occurred is also imperative. The importance of using the metallurgical microscope when dealing with phase examination was mentioned.

Failures due to mechanical reasons are often caused by dynamic or static loading but very seldom by compressive loading.

The acceleration of failure is often due to improper choice of materials. Improper figuring of the stress level is another. The price of a material does not have a functional bearing in application. Yet, this latter factor is often the criteria for choices of substitute materials even though higher priced materials are not always the best materials for the job. Another likelihood pertaining to the acceleration of failure is when a customer changes the service of a product and misapplication results. Defects in material due to its composition or processing in manufacture are also possibilities.

In conclusion, Mr. Low suggested the following methods of preventing failures: draw intelligent material specifications and insure that such are put in use; do not rely alone on aids such as the SAE and AISI analysis lists to do your job; make sure that the sales department obtains the right information on the customers' application of a product; check out product design by proof testing; educate the customer on the limitations of the product; initiate better communications between all engineering departments so that the group as a whole is informed properly; effective inspection; and, finally, have one person responsible for material specifications and for material substitutions.

Example of corrosion and other causes of failure were illustrated and slides were shown to the group.—**Reported by R. N. Libsch and O. A. Scott for Springfield.**

Buffalo Hears Talk on High-Temperature Metals

Speaker: R. W. Fountain

Electro Metallurgical Co.

Categorizing heat and corrosion resistant alloys by indicating their maximum operating temperature is misleading in that materials do not possess all of their optimum properties under any one set of conditions, said R. W. Fountain, section leader and research metallurgist, Metals Research Laboratories, Electro Metallurgical Co., at a meeting of the **Buffalo Chapter.** In discussing "High-Temperature Metals," Dr. Fountain presented the background for the growth in importance of this family of materials. He pointed out that the equipment used in most engineering fields is being designed to operate at even higher temperatures and stresses; for example, stationary power plants are now operated at 1200° F. whereas just a few years ago 800° F. was considered the optimum operating temperature.

For the purpose of evalution, Dr. Fountain limited his comments to metal using roughly the criteria of rupture in 100 hr. at 20,000 psi. as defining useful life. Using this criteria, aluminum-base alloys are limited to approximately 500° F.; titanium alloys, 900° F.; iron-base alloys, 1300° F.; nickel and cobalt-base, 1600° F.; and molybdenum, 1800° F. If these are the maximum operating temperatures of our best heat and corrosion resistant alloys, where then are our alloys coming from to operate at temperatures in excess of 2000° F.?

To indicate the direction in which this weighty problem might be solved, Dr. Fountain reviewed the mechanisms for strengthening high-temperature materials, namely, the matrix and multiphase methods. These processes may be accomplished by either the addition of solid solution solute elements or the addition of elements that will be subsequently precipitated as substantially hard particles within the lattice structure (i.e., carbides, nitrides, and intermetallic compounds.)

Results of recent research suggest that the maximum service temperature at which a material exhibits an adequate engineering strength may be related to its melting point. For pure metals, the ratio between the maximum service temperature and the melting point is about 0.4 when both temperatures are expressed in degrees Kelvin. This ratio is effectively increased by alloying, the upper limit being approximately 0.8. Experimental evidence on nickel-base alloys supports this idea as well as consideration of the recrystallization temperatures and the diffusivity data for pure metals and alloys. If the validity of this relation is accepted, then columbium, molybdenum, tantalum and tungsten look promising for future alloy-base materials.

Oxidation resistance of the so-called refractory metals series is the principal deterrent to their widespread usage at the present time. If the oxidation problem could be surmounted, it would then appear that alloys of molybdenum and columbium would be extremely attractive for operating temperature usage up to perhaps 2600° F. Tungsten, although extremely attractive on an absolute strength basis, loses much of its appeal as soon as the comparison is made on the basis of strength-to-weight ratio rather than strength only. In connection with the strengthening of high-temperature alloys by hard particles, Dr. Fountain indicated that considerable work is being performed in the field of dispersion hardening by the mechanical addition of hard particles. The sintered aluminum powder products are characteristic of this family of materials. Current research is being carried out on such combinations as molybdenum to which 1% zirconium oxide has been added. The addition of the zirconium oxide more than doubles the rupture strength of molybdenum at 1800° F.

In conclusion, Dr. Fountain stated that in consideration of current and new alloy design ideas, it appears that developments in high-temperature materials will be very significant in the near future.—**Reported by G. F. Kappelt for Buffalo.**

Explain Cold Extrusion of Steel

W. W. Wishart (Left), and R. W. Gardner (Right), Verson Allsteel Press Co., Who Presented a Talk on "Cold Extrusion of Steel", and R. W. Smith, AC Spark Plug Division, Are Shown at a Meeting Held by Saginaw Valley

Speakers: R. W. Gardner and W. W. Wishart

Verson Allsteel Press Co.

An interesting discussion on the "Cold Extrusion of Steel" was presented at a meeting of the **Saginaw Valley Chapter** by R. W. Gardner, senior engineer, and W. W. Wishart, metallurgical engineer, Verson Allsteel Press Co.

Mr. Gardner discussed the mechanical aspects of cold extrusion of steel, using a series of slides to illustrate his descriptions of presses, tooling and lubricants used, while Mr. Wishart discussed the metallurgical aspects of the process, using slides to illustrate the relationship of the physical properties of steel to the needs of the cold extrusion process.

The development of suitable lubricants has been a vital part of successful cold extrusion. Chemical treatments of the phosphate type are widely used, although research in this field is extremely active. Without a satisfactory lubricant, cold extrusion of steel is not a practical production process.

Under given conditions of cold deformation, the extrusion pressure depends upon the yield and tensile strengths of the steels used. Flowability of various heats of steels is affected markedly by heat treatment and structure.

Die design, materials and construction are critical and require the most careful attention. While information is gradually accumulating and being correlated, it is not yet possible to completely specify in advance the die design which will work best on a new part or a new steel composition. Because of the high tooling costs, the process is, at present, best suited to mass production methods.

Advantages of cold extrusion include: saving of material and time because of fewer operations and less machining; uninterrupted fiber flow with resulting greater load-carrying capacity; good surface finish and retention of tolerance within close limits; and lower machinery investment and the utilization of less floor space. —**Reported by A. R. Tinetti for Saginaw Valley.**

Materials Topic at Eastern New York

From Left: A. B. Kerr, Bakelite Co., A. A. Burr, Chairman, R. L. Hadley, Major Appliance Laboratory, General Electric Co., and J. E. Burke, Research Laboratory, General Electric Co., Were Members on a Panel Discussing "Materials" at a Meeting Held Recently by the Eastern New York Chapter

A round table discussion on "Materials" was the highlight of a recent meeting of the **Eastern New York Chapter.** J. E. Burke of the Research Laboratory, General Electric Co., discussed "Ceramics"; A. B. Kerr, new products development, Bakelite Co., spoke on "Plastics"; and R. L. Hadley, major appliance laboratory, General Electric Co., talked about "Metals". Each speaker discussed the general criteria for the selection and application of their respective materials.

Mr. Hadley pointed out that metals are selected over other materials because of their wide range and combination of properties. Some characteristics of metals favoring their selection are formability, electrical and magnetic properties, low cost and dimensional stability. In processing metals, however, equipment is often expensive and specialized.

Mr. Kerr emphasized the importance of plastics in the metal industry. Last year, 3 million lb. of epoxy resin was used in plastic tooling, 12.6 million lb. of phenolics in shell molding, and 200,000 lb. of polystyrene in investment casting. A disadvantage of plastics in tooling is the slow dissipation of heat.

Mr. Burke pointed out that ceramics are completely unique in two applications — refractory linings and piezo-electricity. Ceramics compete with metals in high-temperature applications, but they are brittle. As a protection against corrosion and heat, ceramics complement metals. Glass fibers are used to reinforce plastics. The high cost and lack of ductility limit the extensive use of ceramics as a material.

Following the presentation, the floor was opened for questions concerning the relative merits of the three types of materials.—**Reported by L. Taniello for Eastern New York.**

Penn State Schedules Short Course on Materials

Closely allied with today's emphasis on research and development of rockets and guided missiles is the subject matter of the Pennsylvania State University's short course on "Materials Engineering Design for High Temperature", which will be held June 29 to July 3, 1958, on the Penn State campus.

Other applications of materials used at high temperatures include gas and steam turbines, aircraft engines, components of nuclear energy, and equipment used in the petroleum and chemical industries.

The course will include metallurgical properties, mechanical static properties at high temperatures, thermal shock, fatigue properties and design for high temperatures.

Lectures will be given by a number of prominent engineers and scientists in the field, including J. D. Lubahn, General Engineering Laboratory, General Electric Co.; B. J. Lazan, head, department of mechanics and materials, University of Minnesota; L. F. Coffin, research department, General Electric Co.; S. S. Manson, National Advisory Committee for Aeronautics; M. J. Manjoine, Westinghouse Research Laboratories; C. C. Bigelow, Pratt and Whitney Aircraft; B. E. Gatewood, Air Force Institute of Technology, Wright-Patterson Air Force Base; and J. E. Dorn, University of California.

For further details, contact Joseph Marin, Department of Engineering Mechanics, The Pennsylvania State University, University Park, Pa.

Talks on Nuclear Technology

Speaker: J. Sausville
Curtiss-Wright Corp.

Joseph Sausville, chief, materials division, nuclear power department, Curtiss-Wright Corp., presented a talk on "Metallurgy and Nuclear Technology" at a recent meeting of the **Penn State Chapter.**

Following a brief description of a nuclear reactor, Dr. Sausville discussed the uses of metals and alloys in reactors. These uses included their application as fuels, central rods and moderators.

Dr. Sausville concluded his talk by describing the types of damage caused by speeding neutrons and their effects on the properties of metals and alloys.—**Reported by Richard Heacox for Penn State.**

Albuquerque Recognizes Its Chairmen

At a Meeting of the Albuquerque Chapter, Chairman Douglas W. Ballard (Right), Presented a Certificate of Recognition to Past Chairman Bob Lemm (Left), Who, in Turn, Presented a Certificate to Douglas W. Grobecker (Center), for His Efforts in Promoting the Symposium on "Heat Tolerant Metals for Aerodynamic Applications" Sponsored by the Chapter Last Year

A.S.M. Award Winners See Bright Future

Each year, the American Society for Metals sponsors a nation-wide program of Science Achievement Awards, for which 140 entries receive U. S. bonds for projects covering metals.

Many letters have been received from the top winners of the 20 awards of $100 bonds. Each of them expresses enthusiasm about the study of higher mathematics, physics and chemistry. According to these letters, we may well expect some outstanding physicists, nuclear engineers, research chemists and highly skilled metallurgists—and very soon!

One of the winners states: "I will be attending Ohio State University in the Fall. My goal is to get my Ph. D. in physics and specialize in nuclear physics". Another winner, attending the University of Illinois, gives the following as his course of study: "Calculus, chemistry, physics, general engineering, drafting, descriptive geometry—followed by advanced calculus and advanced physics". Another student, from British Columbia, states: "I plan to improve and continue with my science projects". A New York winner tells us: "In college I shall major in either nuclear physics or chemistry or perhaps both. As yet, I have not decided whether to teach or go into industry". A winner from Rhode Island confides: "I wish to say that when I wrote my report on my project, I was primarily interested in electronics and electrical engineering, but after reading the pamphlets which you sent me on metallurgy, I find myself very interested in this fine profession. I will make one of the sciences my career".

Some of the winners are still concentrating on the development of their interest and skill. A New York high-school winner states: "I am still thrilled about having won my National Future Scientists of America Award. I am very eager to begin a new project and I thought with your experience, perhaps you could suggest a problem I could tackle in the field of metallurgy". Letters of this type are reproduced and sent to the A.S.M. chapter chairmen for a personal contact with the winners.

The 20 annual winners of $100 U. S. bonds are selected by a special committee appointed by the National Science Teachers Association. These winners are also winners of awards in the regional judging prior to their selection as qualified candidates for the top award.

A.S.M. is the largest publisher of books for the metals industry in the world.

Discusses Extractive Metallurgy

Chattanooga Chapter Members Heard Frank Stephens, Chief of Extractive Metallurgy, Battelle Memorial Institute, Speak on "Research and the Future of Extractive Metallurgy" at a Recent Meeting. Shown are, from left: John Pikcunias, chairman; Mr. Stephens; and Julian Glasser, Cramet, Inc.

Speaker: Frank M. Stephens Jr.
Battelle Memorial Institute

The **Chattanooga Chapter** heard a talk on "Research and the Future of Extractive Metallurgy" by Frank M. Stephens, Jr., chief of the extractive metallurgy division, Battelle Memorial Institute, at a meeting which was held recently.

Mr. Stephens defined extractive metallurgy as any operation for obtaining material from its naturally occurring ores or compounds. Man's first progress in extractive metallurgy was in obtaining copper from its ores. Leaching of gold from its ore is another example. One of the marks of progress in extractive metallurgy is the ability to profitably obtain metals from poorer ores than formerly thought possible. Once 5% copper ore was the minimum, while now .83% ore can be extracted profitably.

Today, chemical processes using high temperature and high pressure to take complex ores apart are being explored. Controlled roasting techniques where solids are treated in gas beds are being developed. Low-grade ores can be converted by direct reduction using this method. In extractive metallurgy today new methods of basic chemistry are not as important as control. Two methods that have been developed recently are the ion exchange and the solvent extraction methods where an organic solvent in contact with water absorbs the wanted material.

The future of extractive metallurgy depends on the development of new equipment and techniques for applying chemical processes which so far have been impossible, and the development of new techniques and new chemical processes in which presently nonusable ores can be utilized.—**Reported by J. H. McMinn for Chattanooga Chapter.**

—Forging the Key to Unlock the Future (The Key to the Future Is Forged of Metal)

Akron Offers Courses

The Evening Division of the University of Akron, through its Community College Program and in cooperation with the Akron Chapter of the American Society for Metals, is offering nine courses for persons who desire further study in metals. The courses are conducted by men with practical experience in their subject and in teaching, and are taught to help persons achieve greater competence in this area and to increase their knowledge in a rapidly growing field. A Community College Award of Achievement in Metals will be presented to persons completing six courses successfully. Four or five courses will be offered each semester. Courses include: Elementary Ferrous Metallurgy, Elementary Nonferrous Metallurgy, Ferrous Welding Metallurgy, Elements of Heat Treatment, Metal Castings Principles, Inspection of Metals, Precision Casting Fundamentals, Stainless and Toolsteels.

The courses meet once weekly for 1½ hr. for 12 weeks and begin in September and February of each academic year. Further information from: Evening Division, University of Akron, Akron 4, Ohio.

Talks on Continuous Casting Process

Rufus Easton, Manager, Continuous Casting Section, Koppers Co., Inc., Presented a Talk on "Continuous Casting of Steel" at a Meeting of the Canton-Massillon Chapter. He discussed the background of continuous casting and the principles and purpose of the process. Shown are, from left: W. W. Scheel, vice-chairman; Mr. Easton; Joseph G. Mravec, technical chairman; Wade Watts, football coach, McKinley High School, coffee speaker; and G. Brainard Trumble, chairman. (Reported by G. L. Perkins)

New Jersey Hears National Officers

G. M. Young, Aluminum Co. of Canada, Ltd., and Then President-Elect A.S.M., Gave a Talk Entitled "Light Metals in Heavy Industry" at a Meeting of New Jersey Chapter. W. H. Eisenman, national secretary, presented a survey of current and anticipated activities at National Headquarters. Since Mr. Young will give this same talk before many of the chapters this year, it will not be reported here. Shown are, from left: R. W. Thorne, treasurer; Mr. Young; S. G. Lindstrom, chairman; Mr. Eisenman; and H. F. J. Skarbek, secretary. (Reported by T. A. Schneider for New Jersey)

Awards Given to Montreal Students

The Chairman of the Montreal Chapter, Keith Shaw, Presented A.S.M. Scholarships to Two Students From the Third Year of Montreal Technical School. These two young men, taking the metallurgy course, were Kenneth Tokeda in the English Section and Marc Boucher in the French Section. Pictured, from left: Mr. Boucher; Mr. Shaw; Mr. Tokeda; and Rosario Belisle, principal, Montreal Technical School. (Reported by G. Norman)

Effect of Melting on Hydrogen Content of Steel Baltimore Topic

Speaker: H. Epstein
Bethlehem Steel Co.

Henry Epstein, research department, Bethlehem Steel Co., presented a lecture on the "Effect of Melting Practices on the Hydrogen Content of Steel" at a meeting of the **Baltimore Chapter.**

Dr. Epstein stated that hydrogen, an unwanted element in steel, comes primarily from moisture introduced into the melting furnace. The two main sources are moisture formed as a product of fuel combustion, and moisture contained in bath additions. Some of the moisture dissolves in the slag and is transferred to the liquid metal surface where it is reduced to hydrogen and absorbed. The process of hydrogen absorption is counteracted to a degree by the flushing action of carbon monoxide gas bubbles resulting from carbon oxidation. The carbon monoxide bubbles formed on the furnace hearth remove some of the hydrogen as they rise up through the liquid metal. During the carbon oxidation or "boiling" period of the heat, the hydrogen content reflects the net effect of the rate of hydrogen absorption and the rate of hydrogen removal provided by the evolution of carbon monoxide gas. Under deoxidized conditions and in the absence of carbon monoxide gas evolution, the hydrogen content tends to increase toward an "equilibrium" value dictated by the moisture content of the furnace atmosphere.

Acid openhearth steels were shown generally to contain less hydrogen at tap than basic openhearth steels. This was attributed to the nature of acid slags which provide a lower rate of hydrogen absorption than do basic slags.

The basic electric steels were shown to contain less hydrogen at tap than basic openhearth steels. This was attributed to the lower moisture content of the electric furnace atmosphere due to the absence of fuel combustion products. In basic electric two-slag practice, where the heat is finished under deoxidized or "reducing-slag" conditions, the hydrogen content was shown to be markedly influenced by the absolute humidity of the shop atmosphere.

The tapping and teeming operations were also shown to be critical with respect to controlling the final hydrogen content of deoxidized steels. Moisture contained in runner and ladle refractories and the use of moist or hydrogenous ladle additions cause damaging increases in the hydrogen content.—**Reported by E. C. Beatty for Baltimore.**

Reviews Testing Methods At Canton-Massillon

Speaker: W. A. Black
Republic Steel Corp.

"Nondestructive Testing" was the subject of a talk given by W. A. Black at a meeting which was held recently by the **Canton-Massillon Chapter.**

According to Mr. Black, the purposes of nondestructive testing are not only to avoid shipping an unsatisfactory product, but also to help improve processing and to evaluate experimental work. With proper management, causes of trouble can be located far back in the process, and it is in this type of application that nondestructive testing is put to its ultimate use.

A short movie showed in close-up slow-motion photography the pouring of molten steel into the mold. Possible origin of defects was illustrated by the falling of a solidified wall crust of scale, oxide and foreign material into the molten metal in a late stage of pouring.

No method of nondestructive testing is entirely comprehensive. The method using particles suspended in water or fluorescent liquid may be used in detecting surface cracks. Defects far below the surface are located by X-ray or echo-ultrasonics. A resonance-type ultrasonic method may be used to determine the presence of a lamination.

Illustrations of ultrasonic testing methods included inspection for internal defects in titanium ingots, location of a cracked shaft in a motor component in a mine truck motor, inspection of a crank-shaft 60 ft. long by 18 in. diameter for an ore carrier, and inspection of rolled billets in study of new hot top design.

Another method that has been successful in detecting internal defects is the eddy current method. By inducing a current flow in the article and measuring the changes caused by a defect, the presence or size of the defect can be determined. One eddy current method is the Farrowtest, used on tubes and bars. It was designed originally for testing tubing for aircraft and boilers. In tests comparing it with the hydrostatic pressure tests, it has been determined that the hydrostatic test will permit the acceptance of large cracks that are readily rejected by the Farrowtest. Pressure testing has an additional drawback in that it tends to increase the depth of cracks without causing them to leak.

Mr. Black cautioned that in selecting and setting up any nondestructive test, care must be exercised in defining not only the variable to be rejected but also the variables that are satisfactory and may be passed.—**Reported by G. Lewis Perkins for the Canton-Massillon Chapter.**

Reviews Nonferrous Metallurgy Trends

Bruce Gonser, Battelle Memorial Institute, Reviewed "Some Trends in Nonferrous Metallurgy" at a Meeting Held in Kansas City. Shown, from left, are: Dave Goldberg, chairman; Dr. Gonser; and Pat Kenyon, vice-chairman

Speaker: Bruce Gonser
Battelle Memorial Institute

Bruce W. Gonser, Battelle Memorial Institute, spoke on "Some Trends in Nonferrous Metallurgy" at a meeting in **Kansas City.**

The changing field of metallurgy is one of constant broadening, with emphasis here and there, rather than complete shifts in activity.

One of the pronounced trends has been the increased attention to metal purity. This has been promoted by the realization of the importance of nonmetallic impurities, including gases. Purity has been produced most dramatically by metallurgists in cooperation with physicists in the field of semiconductors where almost unbelievable controlled purity is demanded. Almost equally dramatic has been the growth in producing and investigating the unusual metals, many of which have assumed importance only after their true properties were revealed by extensive purification. A great field of basic investigation still lies ahead in making metals of exceptional purity and systematically finding the quantitative influence of single and multiple impurities on various properties of interest.

The demand for materials of construction for higher and higher temperatures has brought into prominence the need for more information on the mechanical properties of the high melting metals and their alloys—tungsten, tantalum, rhenium, molybdenum and columbium. Likewise, along with the contemplated use of these and other metals that are susceptible to attack by oxygen or nitrogen at high temperatures, such as zirconium, vanadium and titanium, has come the demand for protection against these gases. Alloying so far has aided only moderately, if at all, and much attention continues to be given to cladding and to protective coatings by various means. This brings about the need for co-operation between metallurgists and ceramists.

With the need for increased strength of many metals at higher than normal temperatures of use, has come the trend toward adding inert constituents for "dispersion hardening". The incorporation into a metal base of a minor percentage of an oxide or carbide or other insoluble compound, or even another insoluble metal in powder form, may give a surprising increase in hot strength without interfering seriously with workabiilty or other mechanical properties. This may apply to common metals such as lead, copper and aluminum, as well as to high-temperature metals.

One of the interesting examples of metals that have shown ductility when obtained in a highly purified form has been chromium. Much work has been done to demonstrate the effect of minor impurities and to show inherent ductility. However, because of its poor resistance to impact, the recent trend has been to use high-purity chromium in alloys, with iron and nickel, to the extent of 50 to 60% chromium.

A general observation can be made that as the demand for various metals has increased, new sources of supply have been found. Now there are extremely few examples of metals where demand exceeds supply.—**Reported by W. H. Deterding for Kansas City Chapter.**

Manitoba Enjoys Social

Members of the Manitoba Chapter gathered for an informal smorgasbord and evening of entertainment during a recent meeting. About 180 members and guests, including a number of the older members, attended.—**Reported by J. E. Graver for Manitoba.**

Predicts New Rules in Metallurgy

J. C. Wilson, Oak Ridge National Laboratory, Spoke on "Metallurgy With New Rules" at a Meeting of Albuquerque Chapter. Shown, from left: H. E. Montgomery, technical chairman; Mr. Wilson; and D. W. Ballard, chairman

Speaker: J. C. Wilson

Oak Ridge National Laboratory

The research metallurgist who studies the effects of radiation on nonfissionable metals must be a scientific Mr. Five by Five, as broad as he is tall. Assuming that he is well fed on metallurgy, he must fatten himself on reactor physics, solid state physics, electronics, test technology and mechanical engineering. According to James C. Wilson, research metallurgist from Oak Ridge National Laboratory, who spoke at a meeting of the **Albuquerque Chapter,** radiation effects is a do-it-yourself frontier where the cost of data is high and statistical sampling low. The metallurgist must design, conduct and analyze each experiment to obtain as much meaningful data as possible.

Mr. Wilson entitled his talk "Metallurgy With New Rules", and discussed three main factors which he feels will alter the rules. First, the metallurgist must devise new environmental testing techniques. The reactor is a horrible place to work, with limited space and wide variances in dosage and temperature. To expose a decent number of samples in the available space, Mr. Wilson had to use samples $\frac{1}{3}$ the size of standard tensile specimens. He also had to record which end of the specimen was closer to the radiation source (a point 5 or 6 in. farther from the radiation source will receive about 1/7 the dosage of the closer point). Gamma-ray heating also varies greatly and temperature has to be measured at many different points. Fortunately, radiation does not affect thermocouple readings, but the metallurgist has to employ considerable ingenuity in the location of these instruments.

The second factor involves the new behavior of familiar metals when irradiated, or the little known behavior of not so familiar metals. Radiation effects may be roughly compared to cold working, alloying (irradiated copper acts more like brass), or annealing, depending upon circumstances. Mr. Wilson showed several slides which illustrated these effects. Slides of impact data were particularly interesting because they revealed that impact data for irradiated metal usually fall on a smooth curve. This fact can be used as a leveling tool to achieve more uniform experiments. In general, irradiated metals behave as completely new materials and are not subject to handbook predictions. Therefore, boiler codes, ASTM standards and other specifications may have to be revised. This is the third new problem. As yet, no one knows how to write rules for irradiated metals.

In conclusion, Mr. Wilson stated that radiation effects may be used in research to speed up diffusion-controlled processes, to study properties of dislocations in metals, and brittle fracture. Radiation effects research will certainly have an impact on the theory and practice of metallurgy.—**Reported by C. A. Scott for Albuquerque Chapter.**

—The Future Is Reflected in Metals—

Covers History of British Columbia's Steel Industry

Speaker: John R. Belyea

Vancouver Steels Ltd.

John R. Belyea, superintendent, Vancouver Steels Ltd., presented a talk on "British Columbia's Steel Industry", with specific reference to the present status and future prospects of Vancouver Steels Ltd., at a meeting of the **British Columbia Chapter.**

Mr. Belyea's talk was primarily a history of the first steel plant established in British Columbia and the only one currently operating for the purpose of making steel billets. He covered the complete history of the founding and growth of Western Canada Steel Ltd., the parent company for Vancouver Steels Ltd., Vancouver Rolling Mills Ltd., and Pacific Bolt Manufacturing Co. Ltd., which three plants comprise British Columbia's present steel industry.

Points of interest discussed in the talk included the annual capacity of the plants, handling methods, production techniques, furnace data and the routine followed in the plant's operation.—**Reported by A. C. Ross for British Columbia.**

—Creators of Metal . . . Benefactors of Mankind—

Structural Sandwich Materials Subject at Penn State Meeting

Speaker: T. P. Pajak

Consulting Engineer

At a recent meeting of the **Penn State Chapter,** Theodore P. Pajak, consulting engineer, spoke on "Structural Sandwich Materials".

Practically nonexistent ten years ago, structural sandwich construction has now become an integral and irreplaceable part of our missile and aircraft structures. This rapid growth can be attributed to the light weight and rigidity which is characteristic of sandwich construction.

The sandwich structure is formed by combining two thin, high-strength facings and a relatively thick but light-weight honeycomb core. The facings resist axial tensile and compressive forces while the core carries shearing forces and assures dimensional stability. A high-strength adhesive is used to join the facings to the core.

The honeycomb core can be fabricated by either the corrugating or the expanding process. Although the end products of these two types of cores are similar, each type has its own advantages in specific applications.

The unique properties of sandwich structures lend themselves very well to optimum design and production of components to meet various types of requirements and specifications. The cores are available in several cell sizes and foil thicknesses and are adaptable to any stress level. Paper, cotton fabric, glass fabric, aluminum and stainless steel are some of the materials which can be selected for specific applications.

Applications of metal sandwich materials range from their use as light diffusers and spandrel panels in buildings, to numerous structural parts in aircraft, including primary structures such as complete wings of missiles.

The speaker supplemented his talk with a movie on the fabrication and uses of metal sandwich materials. —**Reported by Richard Heacox for Penn State.**

Junior Experiment Proves Successful

Six years ago the **Philadelphia Chapter** tried an experiment. They gave their young men an opportunity to form their own organization. The experiment paid off and today the Philadelphia Chapter has an active and enthusiastic **Junior Section** which is providing future leadership for the Chapter.

The Junior Section was born as the result of a suggestion by Walter Kinderman, then a director of the Philadelphia Chapter, who felt the need for a group to appeal to younger members of the Chapter. This group was formed with the following objectives to guide them:

1. To encourage wider participation in Chapter affairs by younger men who otherwise would not participate or contribute for some years to come.
2. To provide a technical and social program of particular appeal to A.S.M. members up to age of 34. The technical programs will emphasize "how to" rather than "why". Career planning and job advancement are emphasized and the social program is one calculated to appeal to the interests of younger people.
3. To foster closer relations with student A.S.M. groups and with the evening students in the A.S.M.-Temple evening course in physical metallurgy.
4. To enlarge chapter membership since most new members are young members.
5. To single out and train the future leadership of the Philadelphia Chapter A.S.M.

Today the Junior Section can be proud of the way its members have participated in the activities of the Philadelphia Chapter. Some have gone into committee work and have become chairmen of key committees. Others have served as key members of various committees. A few have advanced to membership on the Board of Directors of the Philadelphia Chapter. Each Junior has received a better knowledge of the workings of the parent Chapter.

From their very first meeting which concerned "Practical Testing Applied to Industry", the Junior Section has tried to provide a different type of program for its members and any seniors who wished to attend. They experimented with technical lectures, plant visitations, outings and special meetings and came up with a program formula which attracts both junior and senior members. Their "Ladies Night" programs have been quite successful. Barn dances have proven to be an outstanding social success. Another "first" was the serving of refreshments after their meetings.

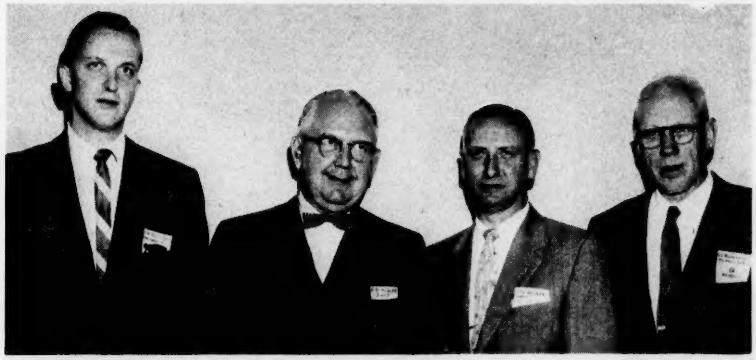
Attendance at the Junior meetings depends on the topics. A purely technical meeting will draw from 30 to 50 people. Plant tours, which have become increasingly popular, will draw from 75 to 100 people. Many senior members attend these plant tours because it gives them a chance to see plants other than their own.

The Juniors have developed a well-knit organization. In addition to a chairman, vice-chairman, secretary-treasurer, and a recording secretary, they have a number of working committees, including program, publicity, membership, entertainment, fellowship, yearbook, education, records and by-laws. Their activities are guided by a Junior advisory committee composed of senior members who attend the Junior executive committee meetings to assist them in their planning.

Credit for the progress of the Juniors must be given to the men who provided capable leadership. Past chairmen of the group were: Ed Fleming (1952-53); William Eberly (1953-54); William Crescenti (1954-55); A. Craig Hood (1955-56); Louis Calzi (1956-57); and Frank Boyle (1957-58).

A review of the six years of Junior activity indicates that the Philadelphia experiment is accomplishing its purpose. The Junior Section is providing its members with an opportunity to learn something about the Philadelphia Chapter and it is serving as a "farm team" for training future leaders for the Chapter. The Philadelphia story can be summed up in one sentence: "Junior Section proves valuable asset to the Philadelphia Chapter".

Compares Brazing and Braze Welding



Arthur N. Kugler, Air Reduction Sales Co., Inc., Spoke on "Brazing and Braze Welding" at a Meeting of the Northwestern Pennsylvania Chapter. Shown, from left: G. R. Bittner, technical chairman; Mr. Kugler; Otto Ehlers, vice-chairman; and G. E. Mohnkern, chairman of the Chapter

Speaker: A. N. Kugler

Air Reduction Sales Co., Inc.

Arthur N. Kugler, chief welding engineer, technical development department, Air Reduction Sales Co., addressed members of the **Northwestern Pennsylvania Chapter** on "Brazing and Braze Welding" at a recent meeting.

Mr. Kugler opened his talk with strict definitions of the two subject processes and a warning of the dangers involved in confusing proper brazing with braze welding in practical application. Brazing is a joining process carried out at temperatures over 800° F. with a filler metal having a melting point at least 50° F. below that of the base metal, in which the filler metal is drawn into the joint by capillary attraction. Braze welding, although carried out over 800° F. with a filler metal having a melting point at least 50° F. below the melting point of the base metal, is not accompanied by capillary attraction of the filler metal into the joint.

In actuality then, the brazed and braze welded joint are fundamentally different. Although the temperatures involved and the filler metal used may be identical, the joint clearances, response to stresses applied across the joint and joint strength differ greatly. Due to the joint configuration and clearances, the filler metal in a brazed joint is subject to shear stresses only, and thus, by control of the surface area covered, can be made considerably stronger than a braze welded joint in which the filler metal may be subjected to tensile, shear or any combination of stresses. The point was brought out, therefore, that the generally high strengths expected from brazed joints are very much dependent upon correct joint clearances.

Braze welding is not a separate process but may be accomplished by any of the normal welding methods, and is not necessarily limited to the welding of joints. For example, the technique may be used in nonstrength applications such as the application of hard metal facings to valve seats or other surfaces subject to wear.—**Reported by T. N. Kelley for Northwestern Pennsylvania Chapter.**

National Officers Visit Milwaukee

National President G. M. Young (Left), and National Secretary W. H. Eisenman (Right), Were Guests at a Recent Meeting in Milwaukee. Mr. Eisenman talked on "Highlights of Our Society", and Mr. Young spoke on "Light Alloys in Heavy Industry". Since this talk will be given before several chapters this year, it will not be reported here. Center is Marvin Evans, chairman of the Chapter. (Reported by J. D. Sullivan for Milwaukee)

McDonnell Aircraft Night At St. Louis Features Panel of Four Speakers

Four well-articulated talks comprised "McDonnell Aircraft Night" at a recent **St. Louis** meeting. Under the direction of vice-chairman Bob Leslie, each speaker covered the highlights of his field concisely, with audience questions being delayed until all had spoken.

S. J. Stockett led off by discussing the "Heat Treatment of Airframe Parts". He pointed out the size limitations necessary for 4130, 4140 and 4340 steels to obtain requisite tensile strengths ranging up to 250 ksi., and spoke of the use of atmosphere control for carbon recovery on as-forged surfaces and of the use of martempering for finish machine parts. An aluminum quench tank was described which would allow heat treatment of alloys 7178 in 3 in. sections and 7079 in sections up to 6 in. thick without fear of intergranular corrosion, which results from inadequate quenching procedures or introduction of severe distortion normally accompanying water quenching.

On the subject of stress relieving and annealing titanium, Mr. Stockett said that time at temperature over 1000° F. should not exceed 30 min. to hold contamination to a minimum. Each lot of titanium has its own quench and age procedure worked out to guarantee mechanical properties.

W. M. Harris spoke next on "Welding Applications for Aircraft and Missile Parts". The inert gas and metallic arc processes used for welding low carbon, 4130 and 4340, as well as stainless compositions like 321 and 347, were described. It was pointed out that sheet in gages 0.030-0.060-in. were commonly fabricated and the use of copper backup bars or an inert gas shield on light-gage jobs was described in some detail.

Mr. Harris stated that, in his opinion, magnesium is the easiest metal to weld. Using the inert gas process, magnesium sheet alloy AZ31B is readily welded. Best practice includes a stress relief after welding. Finally, the care necessary to properly weld titanium sheet—draw filing edges and working in a chamber—was described.

The interesting properties of "Titanium and High-Temperature Alloys" were examined by R. J. Juergens in a thought-provoking manner. Starting with a discussion of titanium's low density, high strength in commercial purity and good corrosion resistance, Mr. Juergens went on to say that titanium alloys remain efficient and attractive even at ambient temperatures of 850° F. However, certain other discouraging factors, such as poor extrudability, poor sheet shape and the difficulty of forming, are often major considerations to the airframe manufacturer. The low tolerance of aluminum alloys for elevated temperature environments was pointed out. The fact that new aluminum alloys compete with titanium on the low end of the temperature scale and high-strength steels on the high end make it imperative that heat treatable titanium alloy systems with improved formability be developed.

M. Deutch concluded the series with a clearly formulated talk on "Material Selection for Missile Applications". He stated that the factors considered for such materials include ease of fabrication, strategic alloy content, ease of heat treatment, weldability and low cost. Low alloy steels such as the NAX steels or Corten are used when they will do the job. The frozen mercury process is used for parts weighing up to 200 lb. and the lost wax process for small parts. Mr. Deutch spoke of the use of aluminum alloy X2020 for service in the 200-400° F. temperature range and the fact that magnesium alloys HK31 and HM21 are highly regarded for service up to 700° F. For higher temperature service, a nickel-free 14.5% manganese steel was mentioned as becoming of importance. Where service temperatures go above 1500° F., the stainless steels, like 19-9DL, were said to be the most satisfactory materials in today's market. —**Reported by D. B. Kulp for St. Louis Chapter.**

Awarded A.S.M. Scholarship at Purdue

At a Recent Meeting of the Purdue Chapter, Acting for the A.S.M. Educational Foundation, R. Schuhmann, Jr. (Left), Chairman of the Division of Metallurgical Engineering, and Leonard Ewalt (Right), Chapter Chairman, Presented Glen A. Gould With an A.S.M. Scholarship and Certificate. Glen is a sophomore in metallurgical engineering at Purdue

Growth of Metals Is Outlined at Ontario

Speaker: Frank Forward
University of British Columbia

Frank Forward, professor at the University of British Columbia, spoke on the "Infancy, Adolescense and Maturity of Metals" at a meeting held by the **Ontario Chapter.**

Prof. Forward touched on the importance of metals in the development of the human race, especially with regard to their effect on the advance of trade, followed by civilization and industry. The importance of the mineral industry to Canadian economy was stressed, this being at the stage where infancy is progressing to adolescense. The trend was illustrated by a growth curve for the use of metals, similar in shape to curves representing all forms of human endeavor, with a slow first growth, a rapid increase during adolescense and a slowing up in maturity. This was contrasted with the curve for a wasting asset which starts similarly but, in maturity, falls off very rapidly, leaving a widening gap between the use of a raw material and its production. Mineral industry peaks were reached in the United Kingdom 75 years ago and in the United States 10 years ago, whereas Canada is approaching a stage of rapid development and will be looked to as a supplier to older industrializations.

Four minerals are essential to industrial development—oil, sulphur, iron ore and coal. Great Britain, France, Germany, Russia, China, Japan, the United States and Canada need these materials. In Canada they are over-abundant, whereas in the United States, the United Kingdom, Japan and Europe, consumption of some of these minerals exceeds supply. The United States is the biggest producer and user of raw materials, but there is a widening gap to an extent that the rest of the world must double its production in order to satisfy United States needs by 1975.

Canada should examine the position very closely since it would appear that within 10 to 15 years the United States would be very short of metals and even of petroleum. Attention should be paid to the possibility of further manufacture in Canada before parting with valuable raw materials. It is not clear that the United States is giving sufficient thought to this aspect as evidenced by the tariff situation.

Considerable energy is required to produce metals, and more for their fabrication. Thus, in the adolescent period the need for power increases rapidly. The available water power resources of central Canada are already largely developed and, in enormous areas, such as the Province of Ontario, it is necessary to bring gas from the West to provide energy. Power requirements are predictable and estimates based on consumption of 116 million kw. in the United States forecast 500 million kw. within 50 years. As hydro and thermal resources are not sufficient to provide this energy, nuclear power is essential for industrial development.

A similar situation exists in Canada, and even in British Columbia, where there are undeveloped hydro resources, the British Columbia Electric Co. is now spending 100 million dollars for thermal power plants.

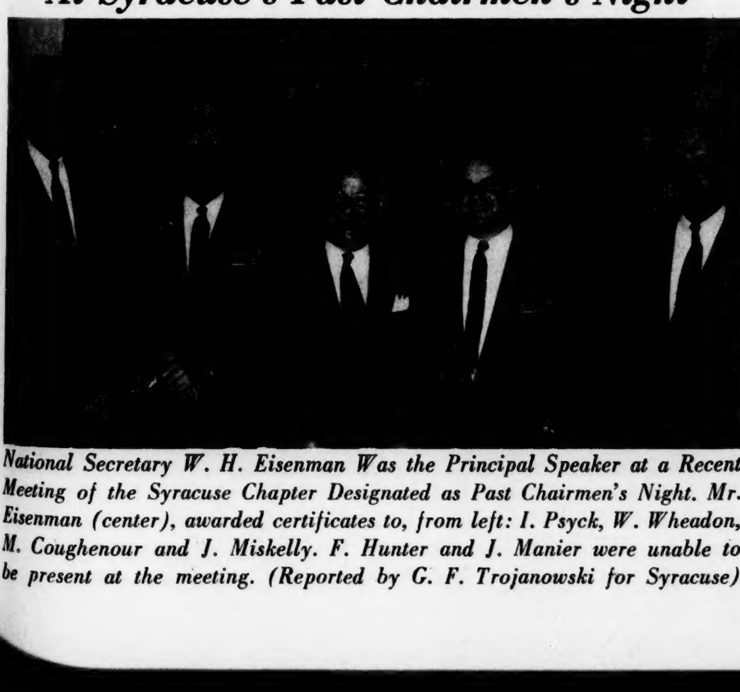
There has been much talk of a need for more engineers, but Prof. Forward would qualify this to better engineers and technical institute graduates. For Canada, with a high proportion of its national income resulting from exports, there is need to export engineers and scientists to consumer countries if the export trade is to be maintained. To train people of this caliber in adequate numbers will require a considerable extension of the facilities for fundamental and applied research.

Metals that have reached economic maturity are iron, copper, zinc and lead. Others are in the adolescent stage, an example being aluminum of recent prodigious growth, while yet others, such as titanium and magnesium, are still in their infancy.—**Reported by H. G. Warrington for Ontario Chapter.**

On Western Ontario's Experts Panel

Shown at Western Ontario's Annual Stump the Experts Night Meeting Are, From Left: Jerry Halliday, Windsor Tool and Die Co.; A. Orr, Atlas Steel Co.; Ray Cyr, Chairman; D. Balint, International Tool Co.; and J. B. Blyth, Walker Metal Products. A. Earl was technical chairman of the meeting, which was sponsored by Atlas Steel Co. (Report by F. Miller)

At Syracuse's Past Chairmen's Night



National Secretary W. H. Eisenman Was the Principal Speaker at a Recent Meeting of the Syracuse Chapter Designated as Past Chairmen's Night. Mr. Eisenman (center), awarded certificates to, from left: I. Psyck, W. Wheadon, M. Coughenour and J. Miskelly. F. Hunter and J. Manier were unable to be present at the meeting. (Reported by G. F. Trojanowski for Syracuse)

Describes New Magnesium Alloys

T. E. Leontis, Dow Chemical Co., Spoke on "New Magnesium Alloys" at a Meeting of the Chattanooga Chapter. Shown are, from left: Gayle Wadsworth, treasurer; Dr. Leontis; and John Pikcunias, the Chapter chairman

Speaker: T. E. Leontis
Dow Chemical Co.

Members of the **Chattanooga Chapter** heard a talk on "New Magnesium Alloys" by T. E. Leontis, assistant to the director of the metallurgical laboratory, Dow Chemical Co., at a recent meeting.

Dr. Leontis described magnesium as the metal with an inexhaustible supply since each cubic mile of sea water contains 12 billion lb. of magnesium. The industry is growing and is predicted to increase by 15% a year. New rolling mills handling one-ton slabs, new extrusion process equipment, new fabricating equipment, and the increasing use of magnesium as an alloying element in aluminum and as a reductant in the titanium and uranium industries have all helped this increase.

The chief characteristics of magnesium that attribute to its increasing use are its lightness, its chemical properties as a reductant and in the Grignard process, its high electrochemical state which makes possible its use as an anti-corrosion anode, its strength-to-weight ratio, and its forming and shaping properties.

In the field of magnesium alloys, Dr. Leontis described the casting alloys of magnesium-aluminum-zinc which are heat treatable and age hardenable. Corresponding alloys for wrought products were discussed. The use of zirconium as a grain refiner has led to the development of many new alloys during the last ten years. The addition of rare earth metals and thorium has opened a large field of research in magnesium alloys for high-temperature application. The introduction of magnesium alloys containing rare earth metals has extended the upper temperature of structurally useful strength from approximately 300° F. of about ten years ago to about 500° F. at present. The more recently developed magnesium-thorium alloys retain structurally useful strengths up to 700° F. The magnesium-thorium alloys are age hardenable with increased creep strength at elevated temperatures. Zirconium is added to the rare earth and thorium alloys to refine the grain size. Several magnesium alloys containing thorium or rare earth metals are fully commercial products and more recently developed compositions are available on an experimental basis.—**Reported by J. H. McMinn for Chattanooga.**

—Metals Are Vital to Every Industry—

Course on Metal Testing Sponsored by New Jersey

Speaker: Rointan F. Bunshah
New York University

A total of 96 persons engaged in the metals and metalworking industries registered for the series of four lecture courses on "Practical Testing and Evaluation of Metals" sponsored by the **New Jersey Chapter.** The lectures were conducted by Rointan F. Bunshah, metallurgist at New York University.

Designed to be of practical working value not only to metallurgists and engineers but also to those engaged in other phases of the metals industry, the lectures covered fundamentals of metallurgy as well as such tests as X-ray, magnetic particle, penetrant, ultrasonic, microscopic, impact, fatigue, hardness and tensile.

Dr. Bunshah used numerous slides and blackboard diagrams to illustrate his lectures. Two reference books, Inspection of Metals, by H. B. Pulsifer, and Metals in the Service of Man, by W. Alexander and A. Street, were used in conjunction with the course. Very lively question periods followed each lecture.

The series was arranged by the educational committee under the chairmanship of M. Margolis, chief metallurgist, Walter Kidde & Co., Inc. Alex Schwarzkopf, supervisor, experimental methods analysis, Wright Aeronautical Division, was technical chairman.—**Reported by M. Margolis for New Jersey.**

Speaks on Rod and Wire in Worcester

W. C. Clements, Metallurgical Engineer, Bethlehem Steel Co., Presented a Talk Entitled "Rod and Wire, a Commodity" at a Meeting Held by the Worcester Chapter. Shown are, from left: George W. Lyman, technical chairman; Mr. Clements; and Walter Nartowt, chairman, who presided

CHAPTER MEETING CALENDAR

Akron	Mar. 19	Sanginiti's		Testing
Albuquerque	Mar. 20		R. C. Sutton	Materials Engineer in the Atomic Energy Program
Boston	Mar. 7	M.I.T. Faculty Club	Warren Eberley	Alloys of Iron-Nickel Series for Magnetic Election and Glass-to-Metal Sealing
British Columbia	Mar. 12		V. Lysaght	Hardness Testing
Calumet	Mar. 11		R. Weir	Oxygen Steelmaking
Canton-Massillon	Mar. 4	Mergus Restaurant	Wolfgang Steurer	Metallurgical Aspects of Guided Missiles
Carolinas	Mar. 20	Charlotte	C. F. Floe	Nitriding
Cedar Rapids	Mar. 11	Roosevelt Hotel	W. A. Milek, Jr.	Plastic Theory of Structural Design
Chicago	Mar. 10	Furniture Club	B. R. Queneau	
Chicago-Western	Mar. 17	Old Spinning Wheel	W. M. Baldwin, Jr.	Oxidation and Scaling
Cincinnati	Mar. 13	Engineering Society	F. M. Richmond	Comparison of Air Melts vs. Inductovac and Duamelt
Cleveland	Mar. 4	Hotel Manger		Student Affairs Night
Columbus	Mar. 5	Broad St. Church	M. Gladstone	Investment Castings
Dayton	Mar. 12	Engineers Club	J. Y. Riedel	Developments in Toolsteels
Delaware Valley	Mar. 19		C. H. Lorig	Fruits of Metallurgical Research
Detroit	Mar. 10		W. S. Pellini	Factors Which Determine the Behavior of Weldments
Eastern New York	Mar. 11	Panetta's		Geisler Award Night
Ft. Wayne	Mar. 11	Hobby Ranch House	F. G. Tatnall	Is Testing Necessary?
Golden Gate	Mar. 3	Spenger's Grotto	E. M. Kipp	Fundamentals of Wear and Friction
Hartford	Mar. 11	Indian Hill Club	Plant Visit	Pratt & Whitney—Tools or Gages
Indianapolis	Mar. 17	Village Inn	R. S. Day	Heat Process Control
Kansas City	Mar. 19	Golden Ox	E. C. Bertucio	Applications of Chromium Plating
Lehigh Valley	Mar. 7	Hotel Traylor	J. E. Steiner	Hydrogen in Heavy Forgings
Long Island	Mar. 19			Analysis of Service Failures
Los Angeles	Mar. 27	Rodger Young Aud.	R. T. Myers	Stress Relieval of Aluming Plate, Forgings and Extrusions
Milwaukee	Mar. 18	City Club	J. H. Hollomon	Nucleation and Casting Grain Size Control
Montreal	Mar. 3	Queen's Hotel		Electron Microscope
New Haven	Mar. 20	Waverly Inn	J. C. DeMaio	Magnetic and Eddy Current Tools
New Jersey	Mar. 17	Essex House	Adolph Vlcek	Sheet Metal Fabrication
New Orleans	Mar. 5, 12, 19		Educational Series	Corrosion of Metals
New York	Mar. 3	Brass Rail	G. Pond	Fundamental Metallurgy
North Texas	Mar. 6		Peter Payson	Ultra-High-Strength Alloy Steels
N.E. Penn.	Mar. 5	Irem Temple Club	R. Stout	Weldability
Notre Dame	Mar. 12		D. J. Blickwede	Continuous Cooling Transformations in Steel
Ontario	Mar. 7	King Edward Hotel	Social	Ladies Night
Ottawa Valley	Mar. 4	Mines Branch	M. J. Lavigne	Corrosion
Peoria	Mar. 10	American Legion	G. M. Young	Light Alloys in Heavy Industry
Philadelphia	Mar. 28	Engineers Club	C. A. Zapffe	Fractology—Study of Fractures
Pittsburgh	Mar. 13	Gateway Plaza		Young Fellows Night
Quebec	Mar. 18	Laval University	M. Lavigne	Metallurgy and Atomic Power
Rochester	Mar. 10	Chamber of Commerce	Norman Kates	Distortion Control on Production and Tool Heat Treatment
Rockford	Mar. 26	Faust Hotel	O. E. Cullen	Modern Quenching Practices
Rome	Mar. 4	Griffiss Air Force Base	Tour	Ladies Night
Saginaw Valley	Mar. 11	High Life Inn	W. D. Doty	Metallurgy of Ferrous Welding
St. Louis	Mar. 21	Congress Hotel	J. A. Staples	Brass and Copper Tube and Rod
Savannah River	Mar. 12	Tinnerman's Lodge	J. D. Nisbet	Vacuum Melting
Springfield	Mar. 17	Blake's	Movie and Panel	Aluminum
Texas	Mar. 4	Ben Milam	G. E. Linnert	Stainless Steels
Utah	Mar. xx		J. A. Burgard	Metallurgy of Product Design
Washington	Mar. 10	American Assoc. of University Women	A. R. Kaufman	Beryllium-Potentialities and Problems
West Michigan	Mar. 17	Schnitzelbank	R. W. Naus and W. Brinkman	Permanent Mold and Die Castings
Wichita	Mar. 11	K of C Hall	H. J. Forsythe	Process Metallurgy and General Quality Problems
Wilmington	Mar. 12	Powder Mill	G. M. Young	Light Alloys
Worcester	Mar. 12	Hickory House	S. M. Silverstein	Management in Industry
York	Mar. 12	Lancaster	K. Goetzl	Powder Metallurgy

New England Man Is First M.E.I. Grad

Another important milestone in the rapidly developing activities of A.S.M.'s Metals Engineering Institute was marked on Feb. 12 when the first graduate received his diploma at a dinner meeting of the **Worcester Chapter.**

Recipient of this history-making No. 1 Certificate was Ray W. Gilbert, Jr., of Northboro, Mass., employed by Wyman-Gordon Co., Worcester, as a metallurgist in charge of quality control of high-temperature alloys. He has been an employee of the company for 8½ years.

Presenting the certificate to Mr. Gilbert for the successful completion of the M.E.I. course on High-Temperature Metals was Anton de S. Brasunas, director of the Institute. Also on hand to congratulate this first graduate were executives of Wyman-Gordon Co., as well as officers of the Chapter, headed by Walter J. Nartowt, chairman.

"We are pleased to be able to recognize in this fashion the first M.E.I. graduate. He has the distinction of receiving this beautiful certificate of M.E.I., the first ever presented by the Institute, which now has over 500 students enrolled, and is not yet a full year old. Mr. Gilbert completed the work in eight months with grades in the high 90's", said Dr. Brasunas.

Mr. Gilbert is married and has three children.

Dr. Brasunas pointed out that the M.E.I. courses, of which the first 12 of 40 are now available, are all designed to help technicians and engineers in the metals field upgrade their training and sharpen their scientific know-how. Courses are developed for home study or in-plant training classes.

The following M.E.I. courses are now available: Elements of Metallurgy, Heat Treatment of Steel, High-Temperature Metals, Titanium, Metals for Nuclear Power, Stainless Steel, Electroplating and Metal Finishing, Gray Iron Foundry Practices, Oxy-Acetylene Process, Steel Foundry Practice, Primary and Secondary Recovery of Lead and Zinc, and Steel Plant Processes. "Many others are on the way", says Dr. Brasunas. (Further description of courses appears on p. 64.)

As an indication of the tremendous dissemination of engineering information, a compilation shows that in one year the A.S.M. collected, edited, published and distributed over ***one hundred million pages*** **of metallurgical information.**

Milwaukee Panel Covers Forgings

In Honor of the Late E. O. Dixon, a Panel Discussion on "New Developments in the Manufacture and Testing of Forgings" Was Held in Milwaukee by Mr. Dixon's Co-Workers at the Ladish Co. They were, from left: R. B. Shingledecker, heating engineer, who spoke on "Hot Forging of Metals"; C. K. David, metallurgical engineer, who discussed "Improvement of Steels for High-Strength Applications"; R. P. Daykin, research metallurgist, who talked on "Forging of Highly Corrosion Resistant Metals"; C. H. Armitage, technical chairman; Clyde A. Furgason, vice-president in charge of research and metallurgy, who moderated; W. W. Wollering, welding engineer, who spoke on "Experiments on Flow Characteristics of Forging"; and H. P. Johnson, nondestructive testings engineer, who discussed "Applications of Nondestructive Testing in the Manufacture of Forgings" (Reported by D. D. Legg for the Milwaukee Chapter)

Technical Papers Invited for A.S.M. Transactions

The Transactions Committee of the A.S.M. is now receiving technical papers for consideration for publication in the 1959 Transactions and possible presentation before the next national meeting of the Society, to be held in Cleveland, Oct. 27 to 31, 1958.

Many of the papers approved by the Committee will be scheduled for presentation on the technical program of the 40th National Metal Congress and Exposition.

Papers may be submitted any time up to Apr. 21, 1958, for consideration for presentation at this convention. The selection of approved papers for the convention technical program will be made early in May 1958. Manuscripts may be submitted any time during the year and upon acceptance by the Transactions Committee will be processed immediately for preprinting. All papers accepted will be preprinted and made available to any members of the Society requesting them. However, the printing of an accepted paper does not necessarily infer that it will be presented at the convention. Under a new plan of the Society, preprinting of accepted papers is done quarterly. Notification of their availability is published in *Metals Review.*

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, Assistant Secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Should it be your intention to submit a paper, please notify A.S.M. A copy of the booklet entitled "Suggestions to Authors in the Preparation of Technical Papers" will be gladly forwarded. This booklet may help considerably in the preparation of line drawings and illustrations.

A.S.M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared at the Center for Documentation and Communication Research, Western Reserve University, Cleveland, With the Cooperation of the John Crerar Library, Chicago.

Annotations carrying the designation (CMA) following the reference are published also in *Crerar Metals Abstracts.*

A General Metallurgy

57-A. Materials of Construction: Tin and Its Alloys. Robert M. MacIntosh. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1653-1657.

Recent literature on tin technology and applications. 237 ref.
(A general, 17-57; Sn)

58-A. Materials of Construction: Aluminum Alloys. R. L. Horst. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1578-1583.

Literature review of corrosion, design considerations and fabrication techniques, architectural applications in atomic energy field, in chemical processes, food, marine, packaging, petroleum, power industries, and in pressure vessels. 51 ref.
(A general, 17-57; Al)

59-A. Materials of Construction: Lead and Its Alloys. Edward J. Mullarkey. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1607-1611.

Technology and applications. 90 ref. (A general, 17-57; Pb)

60-A. Materials of Construction: Less Common Metals. E. M. Sherwood. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1612-1617.

Literature review on Zr, Hf, Mo, Cb, Ta, Te, Re and Cr as construction and engineering materials. 143 ref. (A general, 17-57; Zr, Hf, Mo, Cb, Ta, Re, Cr)

61-A. Materials of Construction: Nickel, Including High-Nickel Alloys. R. M. Fuller. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1618-1628.

Review of recent literature on technology and applications. 200 ref.
(A general, 17-57; Ni)

62-A. Materials of Construction: Stainless Steels Including Other Ferrous Alloys. Walter A. Luce. *Industrial and Engineering Chemistry,* v. 49, Sept. 1957, p. 1643-1652.

Review of recent literature on technology and applications. 137 ref. (A general, 17-57; SS)

63-A. Are We Running Out of Metals. Eric A. Brandes. *Product Engineering,* v. 28, Sept. 1957, p. 36-37.

(A11a, A11b)

64-A. Zirconium Hazards Research. Progress Report No. 1 for Sept. 1, 1956 to Feb. 28, 1957. J. A. Herickes and P. A. Richardson. *U. S. Atomic Energy Commission, AECU-3554,* Feb. 28, 1957, 43 p. (CMA)
(A7p; Zr)

65-A. Stainless Steel and Titanium Sandwich Structures. W. J. Lewis, G. E. Faulkner and P. J. Rieppel. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 79. *U. S. Office of Technical Services,* PB 121633, Aug. 1957, 29 p. (CMA)

(A general; Ti, SS, 7-59)

66-A. (French.) Gallium, Metal of the Future. *L'Industrie Chimique,* no. 482, Sept. 1957, p. 278.

(A general; Ga)

67-A. (French.) Germanium, Industrial Metal. P. B. deCleene. *L'Onde Electrique,* v. 37, Aug-Sept. 1957, p. 701-722.

Sources; production of germanium oxide; extraction and refining; zone refining; use of Ge in electrical and electronic fields. 9 ref.
(A general; Ge)

68-A. (German.) Pyrophoric Alloys. H. Nowotny and O. Smetana. *Osterreichische Chemiker-Zeitung,* v. 58, Aug-Sept. 1957, p. 195-208.

Cerium, Mn-Sb alloys and other spark producing metals. 77 ref.
(A general; Ce, Mn, Sb)

69-A. (German.) Use of Common Construction Steel. W. Kuentschner. *Technik,* v. 12, Aug. 1957, p. 555-559.

Application and advantages of rimming steel.
(A general, 17-57; ST-d)

70-A. (Italian.) Air Pollution and Purification in a Foundry. Antonio Riggi. *Fonderia Italiana,* v. 6, Oct. 1957, p. 381-392.

Elaborate installation for control of atmospheric dust and fumes in Fiat foundries in Turin. 21 ref.
(A8a, E general)

The subject coding at the end of the annotations refers to the revised edition of the ASM-SLA Metallurgical Literature Classification. The revision is currently being completed by the A.S.M. Committee on Literature Classification, and will be published in full within the next few months. A schedule of the principal headings in the revised version was published in the February issue.

71-A. (Italian.) Ancient Tuscan Metallurgy. The Follonica Iron Works and the Medici. Bruno Boni. *Fonderie Italiana,* v. 6, Oct. 1957, p. 393-400.

Study of early 19th century objets d'art. History of Tuscan metallurgy and ties of Medici family to this foundry. (To be continued.)
(A2; CI)

72-A. (Portuguese.) Expansion of Steel Manufacture in State of Sao Paulo. Roberto Nami Jafet. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, July 1957, p. 171-193.

Survey of steelmaking from 1590 to date. Production, consumption, raw materials, labor supply, equipment, financing, electrical energy, transport, as related to recent past and presentday scene. (A2; ST)

73-A. (Portuguese.) The Scientific Revolution and the Metals and Alloys of the Future. Luiz Coelho Correa da Silva. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, July 1957, p. 195-214.

Metals and alloys viewed in light of progress in metallurgy since 1945; possible lines of future progress. Emphasis on contributions from field of atomic science. (A9)

74-A. (Russian.) Hard Metals for Metal Cutting Tools. V. Ya. Rassokhin and M. A. Rura. *Stanki i Instrument,* v. 28, June 1957, p. 19-22.

Standard hard metals consist either of W carbide or various combinations of W, Ti, Cb, and Ta carbides. The bonding material in each case is Co. Tables of manufacturers, composition and physical properties of commercial hard metals. 7 ref.
(A general, 6-69)

75-A. Cost Accounting Procedures for the Gray Iron Foundry. Pt. 3. Albert E. Grover. *Foundry,* v. 86, Jan. 1958, p. 103-107.

(A4s; CI-n)

76-A.* Treatment of Water-Borne Wastes From Steel Plants. Ross Nebolsine. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 125-151.

Flue dust, mill scale and oils, soluble oils, waste pickle liquor, phenols, granulated cinder, treatment costs. (A8, D general; ST)

77-A. Science for Electroplaters. Pt. 31. Cyanide Waste Treatment—Chlorination. L. Serota. *Metal Finishing,* v. 55, Dec. 1957, p. 77-80.

(A8b)

78-A.* Metals for Space Travel. F. L. LaQue. *Steel Processing and Conversion,* v. 43, Dec. 1957, p. 691-694, 709-710.

Materials discussed are Mg alloy

HK 31; Al 2024; stainless steel 17-7 PH; Inconel "X"; hardenable Invar; Ti, Mo.

(A general, T24e, 17-57; SGA-h)

79-A. Zirconium, Titanium, and Hafnium for an Atomic Age Market in an Important Chemical and Metals Complex. William Greenleaf. Paper from "Conference on Atomic Energy in Industry", v. 5, p. 147-149. (CMA)

(A general; Zr, Ti, Hf)

80-A. Beryllium. Wallace W. Beaver. Paper from "Conference on Atomic Energy in Industry," v. 5, p. 149-152.

Properties, uses in nuclear reactions and mining processes.
(A general, T11, 17-57; Be)

81-A. Thorium. Howard E. Kremers. Paper from "Conference on Atomic Energy in Industry", v. 5, p. 149-152.

Use in reactors, possible future uses. Increased production presents problem of disposing of surplus rare earths produced as byproducts. 4 ref. (A general, T11, 17-57; Th)

82-A. Use of Refractory Metals and New Ceramics. Bernard Kopelman. Paper from "Conference on Atomic Energy in Industry", v. 5, 1957, p. 154-160.

Molybdenum, columbium, vanadium, silicon carbide, beryllium oxide, magnesium oxide.
(A general; Mo, Cb, V, EG-g, 6-70)

83-A. (English.) **Data on the History of Metallurgy in Hungary. Pt. 5.** A. Schleicher. *Acta Technica,* v. 18, no. 3-4, 1957, p. 427-431.

Manufacture of pig iron from high-alumina ores in the 18th century. 5 ref. (A2, D1; CI-a)

84-A. The Case for Titanium. *Light Metal Age,* v. 15, Dec. 1957, p. 15.
(A general, 17-57; Ti)

85-A. Condensed Review of Some Recently Developed Materials. *Machinery,* v. 64, Oct. 1957, p. 165-180.

Properties and applications of alloys, adhesives and other materials.
(A general, Q general, 17-57)

86-A.* Science for Electroplaters. Pt. 32. Cyanide Waste Treatment—Hypochlorites. L. Serota. *Metal Finishing,* v. 56, Jan. 1958, p. 61-64, 67.

Oxidation of cyanides by hypochlorites proceeds, as with chlorine gas in two stages; with conversion of cyanide to cyanate first, followed by complete decomposition yielding carbon dioxide and nitrogen as the end products. (A8b, L17)

87-A. U. S. Navy Aircraft Fire Fighting and Rescue Manual. Bureau of Aeronautics. *U. S. Office of Technical Services,* PB 121332, Jan. 1956, 241 p. $6.25.

(A7p)

88-A. Use of Trimethoxyboroxine for the Extinguishment of Metal Fires. Pt. 1. Magnesium. R. L. Tuve, R. L. Gipe, H. B. Peterson and R. R. Neill. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 121986, July 1957, 47 p. $1.25.

(A7p; Mg)

89-A. Rare Earths and Thorium. Richard L. Stone. *Baltimore Engineer,* v. 32, Oct. 1957, p. 4-8.

History, sources, development, present applications and possible future uses of Th, Ce, and rare earth elements.
(A general; 17-57, Th, EG-g)

90-A. Iron Industry of the Weald. Frederick Evans. *Iron and Steel,* v. 30, Oct. 1957, p. 469-471.

Brief history of ironmaking in the Weald region of England from Roman times onward, with special emphasis on the 15th, 16th, 17th and 18th centuries. (A2; CI, ST)

91-A. Dust Problems of the Iron and Steel Industry. M. W. Thring and R. J. Sarjant. *Iron and Steel,* v. 30, Oct. 9, 1957, p. 571-573.

Fume and dust content and gas volume for openhearth, arc, cupola, blast and reheating furnaces and Bessemer converter. Methods of dust control presently employed and those under test. (A8a; ST)

92-A. Application and Working of Honeycomb Core. Pt. 1. W. A. Nordhoff. *Western Machinery and Steel World,* v. 48, Oct. 1957, p. 87-91.

Features of honeycomb materials and properties of aluminum and stainless steel honeycomb; holding and machining methods. (To be concluded.)
(A general, T24a; 17-59, Al, SS,)

93-A. (Italian.) **Outlines of Future Scientific Activity of the Instituto Sperimentale dei Metalli Leggeri.** C. Panseri. *Alluminio,* v. 26, Oct. 1957, p. 413-421.

Current and projected research includes study of vacancies in pure Al, internal friction, fatigue strength of metals in general, of light alloys in particular; study of homogenization of alloys via color metallography; metallographic study of radioactive materials; quantitative determination of preferred crystal orientations of high-strength extrusions and rolled products; corrosion and corrosion prevention. (A9h; EG-a 39)

94-A. (Russian.) **Achievements of Soviet Metallurgy.** *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1957, p. 2-17.

(A general)

95-A. (Russian.) **Scientific Achievements in Field of Metals and Machine Building.** I. R. Kryanin. *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1957, p. 56-65.

(A general)

96-A. (Pamphlet.) **Materials Survey—Tungsten.** U. S. Business and Defense Service Administration. 100 p. Dec. 1956. U. S. Government Printing Office, Washington 25, D. C. $.75.

Technical and economic status in relation to material requirements.
(A general; W)

B Ore and Raw Material Preparation

24-B.* Sintering of Hematite Ore Lines. Practice at the Iscor Works, Pretoria. E. Kleen. *Iron and Coal Trades Review,* v. 175, Sept. 6, 1957, p. 549-552.

Experiments in pilot plant and results obtained with Dwight Lloyd equipment. (B16a, 1-52; Fe, RM-n)

25-B. (German.) **Procedures in Ore Preparation. Pt. IV. Flotation Practice.** Georg Grave. *Chemie für Labor und Betrieb,* v. 8, Sept. 1957, p. 371-379.

Laboratory studies. 8 ref. (B14h)

26-B.* Sinter-Bed Ignition. H. Bates. *Iron and Steel Institute, Journal,* v. 187, Dec. 1957, p. 310-314.

Variables affecting sinter-bed ignition and hence the strength of the sinter from the top layer of the bed. There is an optimum rate of heat input and percentage of excess air for ignition and an increase in the moisture content or the particle size of the top of the bed results in a decrease in the sinter strength. A total heat input of 4000 Btu. per sq. ft. was found to be sufficient for both the lean home and rich foreign ore mixes used. (B16a; Fe, RM-n)

27-B. (English.) **Treatment of Complex Sulphide Ores From Yonaihata Mine, Fukushima Prefecture. Pt. I. Occurrence and Nature of the Ore.** Tsunehiko Takeuchi and Kazunori Gondo. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Oct. 1957, p. 434-445.

8 ref. (B general, RM-n)

28-B. (English.) **Treatment of Complex Sulphide Ores From Yonaihata Mine, Fukushima Prefecture. Pt. II. Flotation.** Tsunehiko Takeuchi and Kazunori Gondo. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Oct. 1957, p. 446-457.

3 ref. (B14; RM-n)

29-B.* Niobium. Pt. 1. Occurrence, Extraction and Refining. J. H. Rendall. *Metal Treatment and Drop Forging,* v. 24, Dec. 1957, p. 491-494.

Extraction of Cb from its ores; reduction to Cb powder; sintering process; welding and brazing. 14 ref. (B general, C general, H general, K general)

30-B. Hardening of Iron-Ore Pellets. B. Seweryński and T. Wlazinska. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, 1955, p. 30-34. (Henry Brutcher Translation no. 3706, Altadena, Calif.)

Previously abstracted from original. See item 84-B, 1955.
(B16b, 1-52; Fe; RM-n)

31-B. Pelletizing of Iron Ores. Z. Krotkiewski and B. Seweryński. *Prace Instytutow Ministerstwa Hutnictwa,* v. 7, 1955, p. 101-105. (Henry Brutcher Translation no. 3707, Altadena, Calif.)

(B16b, 1-52; Fe; RM-n)

32-B.* (Spanish.) **Production of Metallic Magnesium in Argentina. Study of Preliminary Treatment of San Juan Dolomites for Production of Metallic Magnesium.** Federico Carnevale. *Sociedad Cientifica Argentina, Anales,* v. 154, July-Aug. 1957, p. 27-39.

Pretreatment of Mg ores from one of the largest known deposits in Argentina; composition of ores, availability of process materials, electric power and influence of other factors on processes employed.
(B general; Mg, RM-n)

33-B.* Milling Practice at the Lavender Pit Concentrator. H. K. Martin. *Mining Engineering,* v. 9, Nov. 1957, p. 1229-1235.

Flow sheet and description of primary and secondary crushing, primary grinding, flotation and classification operations and tailing disposal in treating low-grade porphyry copper ore. (B13, B14; Cu)

34-B.* L-P-F Treatment of Ray Ore. A. W. Last, J. L. Stevens and L. Eaton, Jr. *Mining Engineering,* v. 9, Nov. 1957, p. 1236-1238.

Flow sheets and description of result obtained in treatment of a copper ore by sulphuric acid leaching, precipitation of dissolved Cu and recovery by flotation. Studies made on laboratory and pilot plant scales.
(B14h; Cu, RM-n)

35-B. Grinding Practice at Tennessee Copper Co.'s Isabella Mill. F. M. Lewis and J. E. Goodman. *Mining Engineering,* v. 9, *Transactions AIME,* v. 209, Nov. 1957, p. 1253-1255.

Data on power requirements and output show that larger slow-speed underloaded ball mill and hydraulic classifier are more efficient than small high-speed normally loaded ball mill and rake classifier.
(B13c, W15n; Cu)

C Extraction and Refining

72-C. Engineering Record Book—Zirconium Chloride Plant, Bechtel Corp. *U. S. Atomic Energy Commission,* TID-7005, Nov. 15, 1951, 246 p. (CMA)

(C19r, 18-67; Zr)

73-C. Solvent Extraction Equilibria for Rare Earth Nitrate-Tributyl Phosphate Systems. L. L. Knapp, M. Smutz and F. H. Spedding. Iowa State College. *U. S. Atomic Energy Commission,* ISC-766, Aug. 1956, 42 p. (CMA)

(C19a; EG-g)

74-C. Production of Pure Metals by Hydrogen Reduction of Their Salt Solutions. Tuhin K. Roy. *Indian Institute of Chemical Engineers,* v. 8, Pt. 2, 1955-1956, p. 83-94.

Equilibrium and kinetic data obtained on the precipitation of Cu, Ni and Co from their salt solutions by reduction with compressed hydrogen. (C26; Cu, Ni, Co)

75-C. (English.) **Production of Manganous Sulphate Solution Suitable for Electrolysis.** Z. Horvath. *Acta Technica,* v. 18, no. 3-4, 1957, p. 209-230.

Electrolyte prepared from Urkut washer waste containing manganese dioxide. 14 ref. (C19n, C23p; Mn)

76-C. (Italian.) **Solid Amalgam Anode for Electrolytic Extraction of Cadmium.** Giovanni Scacciati. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. I, 1957, p. 291-302.

Methods for obtaining, via cementation of Cd with a Zn amalgam, a supersaturated Cd amalgam (containing up to 21-22% Cd) which is found in solid state at room temperature. This permits manufacture of conventional solid anodes which can be used in standard electrolytic cell. High Cd content of the solid amalgam makes possible considerable savings of mercury.
(C29, C23p; Cd)

77-C. Simple Method for Semi-Continuous Casting of Bronze. Pt. 1. E. C. Ellwood, J. C. Prytherch and E. P. Phelps. *Industrial Heating,* v. 26, Nov. 1957, p. 2282-2290.

Operation of machine using graphite dies in casting rods and tubes. (To be continued.)
(C5q, 1-52; Cu-s, 4-55, 4-60)

78-C. Method for the Production of Titanium-Aluminum Alloys by Reduction of Titanium Oxide. Pt. 2. Evaluation of Future. L. F. Mondolfo and A. Roy. *Light Metal Age,* v. 15, Dec. 1957, p. 16-17.

6 ref. (C general; Ti, *Al*)

79-C. Practical Vacuum Treating of Nonferrous Melts at the U. S. Naval Gun Factory, Washington, D. C. V. DePierre. U. S. Naval Gun Factory. *U. S. Office of Technical Services,* PB 131090, May 1956, 26 p. $.75.

(C5, 1-73; EG-a39)

80-C. Mechanism of Formation of Zirconium Sponge in the Magnesiothermal Production of Zirconium. F. G. Reshetnikov and E. N. Oblomeev. *Atomnaya Energiya,* v. 3, no. 5, 1957, p. 459-462. (Henry Brutcher Translation no. 4055, Altadena, Calif.)

Previously abstracted from original. See item 202-C, 1957.
(C26; Sr, 6-74)

81-C.* (Italian.) **Electrolytic Extraction of Cobalt From Cobalt-Bearing Residues Produced During Electro-Extraction of Zinc.** G. Scacciati. *Metallurgia Italiana,* v. 49, Oct. 1957, p. 713-720.

Multistage process terminating in electrodeposition yields high-purity metallic Co in form of deposits 6-8 mm. thick, marketable as such and not requiring further melting and casting in ingots. Work cycle and operating conditions. 7 ref.
(C23n; Co-a)

82-C. (Book.) **Bibliography on Extractive Metallurgy of Nickel and Cobalt.** R. B. Bauder. Bureau of Mines Information Circular 7805. 195 p. 1957. U. S. Government Printing Office. Washington 25, D. C. $.70.

1600 references covering the period January 1927 to July 1953.
(C general; Ni, Co, 11-65)

D Iron and Steelmaking

27-D.* How a Light Vacuum Can Purify Steel. *Canadian Machinery,* v. 68, Sept. 1957, p. 164-166.

Gas-free steel made in experimental quantities by a steam-degassing process. (D8m, D9s; ST)

28-D. Vacuum Melting of Steels Improves Engineering Properties. H. C. Regean, Jr. *SAE Journal,* v. 65, Sept. 1957, p. 67-71.

(D8m; ST, SS, AY)

29-D. Manufacture of Steel by the Oxygen Lance. W. S. Williams. *British Steelmaker,* v. 23, Dec. 1957, p. 378-379.

(D10; ST)

30-D. Liquid Fuel Additives. Uses in Steelmaking. J. Firminger. *Iron and Steel,* v. 30, Dec. 1957, p. 642-644.

Chemical and physical properties of liquid fuels; a benefit derived from the use of additives. Applications of liquid fuel include openhearth furnaces, soaking pits, reheating furnaces and mill furnaces.
(D general, F21b; RM-k)

31-D.* Economic Future of the Large Electric Arc Furnace. W. B. Wallis. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 110-113.

Future of the electric furnace will become unlimited as soon as it is divorced from 100% scrap charge; possible alternates are use of hot metal, use of hydrogen-reduced ores and desiliconized hot metal; production of electric furnace pig iron at lower than present power rates provides another alternative.
(D5, 17-53; ST)

32-D. New Trends in Firing Practices for Open Hearths. James E. Goodin. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 158-159.

Experimental program at Granite City Steel Co. using high-pressure natural gas to replace steam as the atomizing agent in the furnaces.
(D2; ST, RM-m)

33-D. Expansion Program at Great Lakes Steel Corp. Nears Completion. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 180-183, 186.

(D general, W10; ST)

34-D.* Study of the Tuyere Combustion Zone. J. Taylor, G. Lonie and R. Hay. *Iron and Steel Institute, Journal,* v. 187, Dec. 1957, p. 330-341.

The tuyere combustion zone has been explored on an experimental furnace by raceway measurements and gas-composition surveys. Effects of variables such as air velocity and temperature, tuyere diameter, and coke size. Concluded that raceway measurements, which are easy to make, are a reliable guide to the extent of the combustion zone. 8 ref. (D1b; Fe)

35-D. (German.) **Trials With Graded Steel Plant Limestone in the Basic Bessemer Converter.** Karl Ernst Mayer, Hans Jürgen Darmann, Gerhard Trömel and Karl Heinz Obst. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1614-1618.

4 ref. (D3, 1-65; RM-q; ST)

36-D. (German.) **Temperature Losses of Steel After Tapping.** Herbert Neuhaus, Hans-Joachim Kirschning and Werner Münstermann. *Stahl und Eisen,* v. 77, Nov. 14, 1957, p. 1660-1666.

21 ref. (D9n, S16; ST)

37-D. (German.) **Performance of an Openhearth Steel Plant and Blooming Mill. Industrial Engineering Aspects.** Helmut Kallenbach. *Stahl und Eisen,* v. 77, Nov. 14, 1957, p. 1667-1673.

3 ref. (D2, F23n, A5; ST)

38-D. (Russian.) **Increasing Blast Furnace Efficiency.** M. Ya. Ostroukhov. *Metallurg,* v. 2, Aug. 1957, p. 7-10.

Coke consumption, size of sinter and blast pressure. (D1)

39-D. (Russian.) **Thermal Relationships of Openhearth Process When Blowing Oxygen Through the Bath.** V. T. Sladkoshteev and G. A. Podolskaya. *Metallurg,* v. 2, Aug. 1957, p. 21-22.

Details of the operation of a 350-ton openhearth furnace. (D2g)

40-D.* (Russian.) **Burning of Blast Furnace Bottoms and Selection of Air Cooling Design.** S. M. Andonev, O. V. Filipev and G. A. Kudinov. *Stal',* v. 17, Aug. 1957, p. 685-690.

Rate of furnace bottom burning established principle of electromodeling. The rate of burning reduced by air cooling. Two alternative designs of the furnace bottom air cooling system. (D1, W17g)

41-D.* (Russian.) **Bessemer Steel Production by Blowing Oxygen From the Top.** S. G. Afanasev, M. M. Shumov, Z. D. Epshtein, T. V. Andreev, N. I. Beda, I. I. Korobov, O. N. Kostenetskii, S. I. Livshits, P. S. Rubinskii and S. N. Filipov. *Stal',* v. 17, Aug. 1957, p. 693-700.

Converter steel process using technically pure oxygen. Properties of the steel are similar to the properties of openhearth steel. Efficiency of the process is 87-88%. (D3f; ST)

42-D.* (Russian.) **Perfection of Reduction Technology of Rimming Steel.** A. A. Bezdenezhnikh, A. M. Bigeev, E. I. Dikshtein, P. N. Perchatkin and A. I. Sirotenko. *Stal',* v. 17, Aug. 1957, p. 701-707.

New method of computing quantity of ferromanganese to be added to rimming steel at the moment of tapping. The process minimizes steel losses due to boiling in the molds and insures that manganese content is according to specification. 5 ref. (D9r; ST-d, Mn, AD-n)

43-D.* (Russian.) **Transfer of Sulphur Between Gaseous Phase and Basic Openhearth Bath.** S. N. Stupar. *Stal',* v. 17, Aug. 1957, p. 707-713.

Investigation of the mechanism of sulphur transfer between gaseous phase and openhearth basic bath and vice versa allows improvement of steel desulphurization process. 12 ref. (D11h, D2; ST)

44-D. Induction Vacuum Melting . . . Factors for Metallurgical Control. W. E. Jones. *Industrial Heating,* v. 26, Nov. 1957, p. 2256-2264, 2413-2414.

8 ref. (D8m, 1-69; SGA-h, SS)

45-D. Research in the Direct Reduction of Iron Ore. H. S. Turner. *Mining Congress Journal,* v. 43, Dec. 1957, p. 59-63.

Anticipated developments in direct reduction processes should facilitate early commercial applications. (D8j; Fe)

46-D. Vacuum Stream Degassing Takes Hold. K. C. Taylor. *Steel,* v. 141, Dec. 23, 1957, p. 70-72.

Advantages of vacuum stream degassing of steel. (D9s, 1-73; ST)

47-D. Effect of Reducibility of Self-Fluxing Sinter on Working of the Blast Furnace. A. M. Bannykh and A. G. Neyasov. *Stal',* v. 15, no. 11, 1955, p. 963-968. (Henry Brutcher Translation no. 4014, Altadena, Calif.)

Previously abstracted from original. See item 53-D, 1956. (D1, Fe)

48-D. Effect of Heating of the Blast Upon the Working of a Blast Furnace. I. G. Boichenko. *Stal',* v. 17, no. 6, 1957, p. 483-486. (Henry Brutcher, Translation no. 4051, Altadena, Calif.)

(D1b)

49-D. Vacuum Metallurgy (of Steel). Deoxidation and Desulphurization in Vacuum. G. A. Garnyk and A. M. Samarin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk,* May 1957, p. 77-84. (Henry Brutcher Translation no. 4054, Altadena, Calif.)

(D8m, D5c)

50-D. On the Reduction of Hematite by Solid Carbon. K. Shimanaka. *Tetsu to Hagane,* v. 43, no. 9, 1957, p. 1017. (Henry Brutcher Translation no. 4064, Altadena, Calif.)

(D8; Fe)

51-D.* Lime Powder Desulphurization Proves Practical, Efficient. *Iron Age,* v. 180, Oct. 31, 1957, p. 66-67.

Process consists of blowing a suspension of powdered lime either in air or nitrogen through bottom of special ladle and into liquid pig iron. For 12 tons of pig iron, duration of blow was 5 min. with lime concentration of nitrogen of about 0.5 lb. per cu. ft. and flow of about 120 cu. ft. per min. Method reduces sulphur content to below 0.010%. (D9s, D11h; CI-a)

52-D. New U. S. Developments in Direct Reduction. A. Hegarty. *Iron and Steel,* v. 30, Oct. 1957, p. 483-485.

Current efforts in the U. S. in the direct reduction of iron ore including H-iron process, Esso-Little reduction process and U. S. Steel fluidized bed reduction system. (D8j)

53-D.* Influence of Slag on Iron Composition. A. J. Burgess and B. G. Baldwin. *Iron and Steel,* v. 30, Oct. 9, 1957, p. 510-514.

Three-week trial carried out at blast furnace to investigate relation between metal composition and slag properties. Data collected on composition and temperatures of slag and metal at every cast during trial period. Normal practice was followed during first week; in second week slag basicity altered by reducing limestone charge; in third week basicity and sulphur level in iron were returned to normal. Discusses sulphur balance of in-going and outgoing materials, liquidous properties of blast furnace slags, differences in manganese and sulphur contents of roughing and flushing slags and carbon and silicon content in relation to furnace operation and slag contents. (D11n, D1; CI-a, RM-q)

54-D.* Proposal for a Self-Lining Blast Furnace. W. A. Archibald, T. P. Brown and L. A. Leonard. *Iron and Steel,* v. 30, Oct. 9, 1957, p. 515-521.

Nature of the burden and the refractory, movement of materials in blast furnace, forces acting on refractory walls, phase changes and causes of lining failure. Proposals for self-lining blast furnace using refractory nature of burden held in static layer along furnace walls by series of water-cooled shells. Stacked tuyeres suggested for controlling hanging and scaffolds. (D1b, 1-52; RM-h, CI-a)

55-D. Blast-Furnace Slags. B. G. Baldwin. *Iron and Steel,* v. 30, Oct. 9, 1957, p. 522-526.

Apparatus and experimental procedure used in study of liquidus temperatures, rate of melting, crystal growth, crystal movement and viscosity of 20 blast furnace slags representative of those of the United Kingdom. Chemical analysis of SiO_2, CaO, MgO, AlO and MnO and S content. Compares calculated and measured liquidus temperature; discusses primary phase composition, liquidus temperature, basicity and viscosity. (D11n, D1)

56-D. Commercial Vacuum Melting. *Iron and Steel,* v. 30, Nov. 1957, p. 591-594.

Small British vacuum melting installation, its operation and results obtained. (D8m, 1-55)

57-D. (Russian.) **Correction Method in Blast Furnace Operation.** A. N. Redko. *Metallurg,* v. 2, Sept. 1957, p. 3-5.

Relationship between change of optimum ore charge, temperature and humidity of blast, CO_2 content in the gas, specific slag output and coke consumption. Suggestions for immediate correction of the process to maintain silicon and sulphur contents constant. (D1b; Fe, *S, Si*)

58-D. (Russian.) **Control of Blast Furnace Operation by Static Pressures Differences.** P. G. Baranovskii and A. A. Kargin. *Metallurg,* v. 2, Sept. 1957, p. 5-7.
(D1b, Fe)

59-D. (Russian.) **Influence of Lithium Addition Upon Certain Properties of Austenitic Steel.** R. P. Zaletaeva. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 25-27.

Introduction of up to 0.03% Li into austenitic steel considerably reduces contents of the gases in the steel. (D9s; ST, *Li,* AD-q)

60-D.* (Russian.) **Production of Raw Pig Iron Using Oxygen Enriched Blast.** I. P. Bardin, S. K. Trekalo, A. F. Zakharov, F. A. Khilkevich and B. L. Lazarev. *Stal',* v. 17, Aug. 1957, p. 673-684.

Experimental smelting using prepared burden and oxygen-enriched blast. The efficiency of the process was improved. It was essential to use oxygen produced in large plants to lower cost of the process. (D1h; CI-a)

61-D. (Russian.) **Blast Furnace Run at 1.1 Atm. Pressure.** V. P. Onoprienko, B. N. Starshinov, A. A. Tkachenko, V. D. Sinitskii, L. M. Friedin and L. Ya. Portnyi. *Stal',* v. 17, Sept. 1957, p. 772-778.

Significant improvement of performance of the process was obtained. (D1h)

62-D. (Russian.) **Temperature Schedule of Openhearth Smelting of Phosphorus Pig Iron Using Oxygen.** I. A. Zaitsev. *Stal',* v. 17, Sept. 1957, p. 788-792.

6 ref. (D2g; ST)

E Foundry

49-E. Sands for Moulding. *Mechanical World and Engineering Record,* v. 137, Sept. 1957, p. 417-418.

Molding sand properties, their effect on the production of satisfactory cast parts; types of defects associated with unsuitable sands. (E18)

50-E. (German.) **Foundry Practice.** C. Stieler. *VDI Zeitschrift,* v. 99, Aug. 1957, p. 1195-1196.

Literature review. 19 ref. (E general)

51-E. (Italian.) **What Process Shall We Use for Core Making?** *Fonderia,* v. 6, Sept. 1957, p. 381-385.

Advantages and disadvantages of conventional, shell-molding and CO_2 processes, and of method involving use of self-drying binders. (E21g)

52-E.* (Italian.) **Carburization and Decarburization in Industrial Frequency Induction Furnaces.** Elio Calamari. *Fonderia Italiana,* v. 6, Oct. 1957, p. 403-406.

Operational details of carburization and decarburization of ferrous alloys during melting in laboratory and shop installations of low-frequency induction furnaces. (E10b, W18a; CI)

53-E. (Italian.) **Mechanization in Small Foundries.** *Fonderia,* v. 6, Oct. 1957, p. 425-430.

Goals and equipment for gradual mechanization. Mechanization in small foundries should be synonomous with organization of work and simplicity of installations; mechanization in Italian foundries does not necessarily mean the same thing qualitatively and quantitatively as in the more highly industrialized U. S. (E general, 18-74)

54-E. (Russian.) **Casting Tool Blanks in Shell Molds.** Ya. I. Briskin. *Stanki i Instrument,* v. 28, June 1957, p. 22-24.

(E19c)

55-E.* Factors Affecting the Surface Finish of Steel Castings. David V. Atterton. *Foundry,* v. 86, Jan. 1958, p. 78-83.

Research into burnt-on sand. The effective radius of the pores between sand grains varies widely in the foundry and depends on numerous factors, including fineness of the sand, its grading, binder content, degree of compaction, sintering temperature, presence of fusible materials such as metallic oxides, and mold and core dressings of a wide variety. 17 ref. (To be continued.) (E18r; ST)

56-E.* Shrinkage in Tin Bronze. Pt. 2. Clyde L. Frear. *Foundry,* v. 86, Jan. 1958, p. 84-88.

Dissolved gases in melts, with special reference to hydrogen; method of preventing gas pick-up; deoxidation practice. (To be continued.) (E25s; Cu-s, *Sn*)

57-E. Efficient Cupola Operation. T. H. Burke. *Foundry,* v. 86, Jan. 1958, p. 89-93.

Linings, coke, chill tests, fluxes, tuyeres, desulphurization, inoculation and factors affecting chill values. (E10a, W18d)

58-E.* Controlling the CO_2 Process. F. L. Turk, J. J. Gutwald and R. P. Lanz. *Foundry,* v. 86, Jan. 1958, p. 94-97.

Variables investigated include types of sand; proprietary sodium silicate binders; sand mixtures; gassing time; methods of mixing CO_2 sand; variations in carbon dioxide gas, and parting agents. (E18)

59-E. Permanent Mold Casting of Aluminum at the Maytag Co. C. B. Curtis. *Foundry,* v. 86, Jan. 1958, p. 98-102.

(E12, Al)

60-E. Recent Developments in the Manufacture of Castings. Pt. 1. J. L. Rice, R. W. Ruddle and P. A. Russell. *Foundry Trade Journal,* v. 103, Dec. 5, 1957, p. 665-672.

Post-war developments in established foundry practice and in the alloys used for castings. Present status of the various methods, mold production techniques, die-casting developments, shell-molding process. (E general)

61-E. Preview of Ford's New Works—Thames Foundry at Dagenham Nearing Completion. *Foundry Trade Journal,* v. 103, Dec. 5, 1957, p. 673-676.

(E general, 18-67)

62-E.* Recent Developments in the Manufacture of Castings. Pt. 2. J. L. Rice, R. W. Ruddle and P. A. Russell. *Foundry Trade Journal,* v. 103, Dec. 12, 1957, p. 693-702.

Nature and significance of the CO_2 process, precision investment castings, the Shaw process and other techniques. Review of alloy development with reference to gray, malleable irons and spheroidal graphite irons, Cu and Al alloys. (To be continued.)
(E general; CI, Cu, Al)

63-E.* Application of Statistical Control in the Production of Precision Castings. V. diSambuy. *Foundry Trade Journal,* v. 103, Dec. 26, 1957, p. 753-756, 758.

Results of experiments carried out in Italian foundry. Standard deviations of the wax-injection and metal casting processes; problem of tolerances in investment castings.
(E15, S12)

64-E. New Coring Method Broadens Uses of Light Metal Castings. John L. Everhart. *Materials in Design Engineering,* v. 46, Dec. 1957, p. 102-105.

Introduction of small-diameter intricate passages into sand-cast Mg and Al alloys. Proper design can result in savings in weight, space and machining time. (E21; Mg, Al)

65-E. Design of Die-Castings. Pt. 4. Determination of Tolerances. H. K. Barton. *Metal Industry,* v. 91, Nov. 8, 1957, p. 397-399.

(E13, 17-51, 17-55)

66-E. Design of Die-Castings. Pt. 5. Wall Thicknesses. H. K. Barton. *Metal Industry,* v. 91, Dec. 6, 1957, p. 477-480.

(To be continued.) (E13, 17-51)

67-E. (Dutch.) **Compressive Strength of Molding and Core-Sand With Waterglass as a Binder.** H. G. Levelink. *Metalen,* v. 12, Oct. 31, 1957, p. 406-412.

Strength is a function of time of CO_2 and air exposure. (E18n)

68-E. (German.) **Evaluation of Molding.** Hans Jungbluth. *Giesserei,* v. 44, Nov. 7, 1957, p. 681-694.

Break-up curves; ramming tests; sand triangle. 22 ref. (E18, E19)

69-E. (Japanese.) **Vacuum Melting of Various Pig Irons.** Isao Aoki and Tomojiro Tottori. *Casting Institute of Japan, Journal,* v. 29, Sept. 1957, p. 627-631.

Pig irons of different chemical composition showed accelerated precipitation of eutectic graphite, decrease in amounts of Mn, S, Cu and Sn. Graphite nodulization depends on composition. 5 ref.
(E10b, 1-73; CI-a, CI-r)

70-E. (Japanese.) **Gasses in Cast Iron. Report No. 2.** Shigeru Ikeda, Hiroshi Iwanaga and Hiroshi Ono. *Casting Institute of Japan, Journal,* v. 29, Sept. 1957, p. 631-637.

Casting defects due to nitrogen in molten iron and the mechanism of their formation. 7 ref. (E25s, 9; CI)

71-E. (Japanese.) **Results of Fundamental Studies on Foundry Sand in Kawaguchi. Report No. 1.** Eüchi Matsumura. *Casting Institute of Japan, Journal,* v. 29, Sept. 1957, p. 643-648.

(E18)

72-E. (Japanese.) **Research on Cast Iron Treated With Calcium. Report No. 1. Effect on Molten Iron.** Masuteru Maruyama and Akira Watanabe. *Casting Institute of Japan, Journal,* v. 29, Oct. 1957, p. 694-702.

10 ref. (E25q; *Ca,* CI-r)

73-E. (Japanese.) **Study on Cupola Tuyeres. Report No. 3.** Kiyoshi Ishikawa, Ichiro Saeda and Toshio Suzuki. *Casting Institute of Japan, Journal,* v. 29, Oct. 1957, p. 702-707.

With projecting water-cooled tuyeres, blast pressure requirement is lowered, clogging tendency is reduced, and penetration is improved. 3 ref. (E10a, W18d)

74-E. (Japanese.) **Green Sand for Steel Casting. Report No. 5.** Hideo Mikashima and Toshiro Owadano. *Casting Institute of Japan, Journal,* v. 29, Oct. 1957, p. 711-715.

Color adsorption tests. 3 ref. (E18r)

75-E. (Japanese.) **Study on Silica Molding Sand. Report No. 2.** Umeji Harada and Keizo Nishiyama. *Casting Institute of Japan, Journal,* v. 29, Oct. 1957, p. 715-721.

Heating characteristics of four different foundry silica sands. 6 ref. (E18)

76-E. Methods Engineering, With Emphasis on Flow Process-Control Applied to Fettling Shops. F. Gaiger and R. Hancox. *British Foundryman,* v. 50, Dec. 1957, p. 589-596.

(E24, A5)

77-E.* Production of S. G. Iron by the Nickel-Magnesium Process. W. A. Potter. *British Foundryman,* v. 50, Dec. 1957, p. 597-601.

A high-carbon, low-phosphorus iron is essential and it is desirable that Mn and S should also be kept low. For the Mg process, the iron may be hypo or hypereutectic and the C equivalent value may thus lie over a wide range. Generally, the high-carbon irons are better, but in heavy castings there will be some segregation of the graphite spheroids if the iron is hypereutectic.
(E25q; CI-r)

78-E.* Experiments on the Effect of Atmospheric Pressure on Top Feeding Heads. A. Pearson. *British Foundryman,* v. 50, Dec. 1957, p. 601-604.

Experiments were designed to ascertain whether hot spots could be counteracted by the positive introduction of atmospheric pressure to the top feeding head, as many top heads freeze over, resulting in partial vacuum in the shrinkage cavity. All results were checked by radiography. Steel tested analyzed 0.17-0.020% C, 0.3-0.4% Si, 0.5-0.7% Mn.
(E23, E25n; ST)

79-E.* Improved Technique for Determining the Porosity of Cast Specimens. R. W. Ruddle. *British Foundryman,* v. 50, Dec. 1957, p. 605-615.

Rapid and accurate porosity determinations both for research purposes and for analysis of melt quality in works control. Apparatus, testing procedure and method of computing results. 3 ref. (E25q, P10m, 1-53)

80-E. Application of the CO_2 Process in the Production of Steel Castings. I. Rees. *Foundry Trade Journal,* v. 103, Dec. 19, 1957, p. 723-726.

Practice at Glanmorfa Ltd.
(E11, E18, W19g; ST)

81-E. Recent Developments in the Manufacture of Castings. Pt. 3. J. L. Rice, R. W. Ruddle and P. A. Russell. *Foundry Trade Journal,* v. 103, Dec. 19, 1957, p. 729-735.

Magnesium foundry practice. 100 ref. (E general; Mg)

82-E.* Magnesium Precision Castings Open New Production Potential. L. H. McCreery. *Light Metal Age,* v. 15, Dec. 1957, p. 28-30.

Patterns, molds, testing, inspection, drawing practices; suggestions for control from the foundryman's viewpoint. (E15; Mg)

83-E. Design of Die-Castings. Pt. 5. Wall Thicknesses. H. K. Barton. *Metal Industry,* v. 91, Dec. 13, 1957, p. 502-504.

(E13; 17-51)

84-E.* Die Casting. Gustav Lieby. *Modern Castings,* v. 32, Dec. 1957, p. 35-46.

Advantages, machines, alloys and their properties, die-casting design and alternative methods such as sand and permanent molds. (E13, 1-52)

85-E. Fiat. George W. Cannon, Sr. *Modern Castings,* v. 32, Dec. 1957, p. 47-49.

Foundry practice at the Fiat plant, Turin, Italy. (E general, T21)

86-E. Stop-Look-Listen Before You Try Shell Molding. Arthur Woods. *Modern Castings,* v. 32, Dec. 1957, p. 50-54.

European experiences in designing pattern plates, gating and risering, curing, joining, coremaking as well as stack molding. (E19c)

87-E. D Molds Make Precise Steel Castings. *Steel,* v. 141, Nov. 11, 1957, p. 110-113.

Dietert shell mold process used by a Texas foundry to produce carbon and low-alloy steel castings with close tolerances and smooth surfaces. (E16c; ST)

88-E. Precision Investment Cast Tensile Tests of Low Alloy Steel. J. F. Wallace and I. Berman. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131120, Sept. 1949, 49 p. $1.25.

A precision investment casting technique for casting a sound, low-alloy, 357-in. diameter tensile steel bar capable of predicting the optimum properties of a heat of steel.
(E15, Q27; AY)

89-E. (German.) **Iron Cores in East Germany.** Hermann Wesner and Wolfgang Probst. *Giessereitechnik,* v. 3, Aug. 1957, p. 169-172.

Raw material, coatings, manufacture, shapes and dimensions, storage and transportation, need of standards. 2 ref. (E21; CI)

90-E. (German.) **Surface Defects in Steel Castings.** Fritz Brunn. *Giessereitechnik,* v. 3, Aug. 1957, p. 172-173.

Molds made of suitable material eliminate defects in production.
(E21; ST, 9-71)

91-E. (German.) **Proper Design for Castings.** Herbert Klotz. *Giessereitechnik,* v. 3, Aug. 1957, p. 174-178.

Comparative demonstration of old techniques versus new suggestions. (E general, 17-51)

92-E. (German.) **Suggestions to Improve Mold Accessory Equipment.** Heinz Lucas. *Giessereitechnik,* v. 3, Aug. 1957, p. 180-182.

Suitable ejector mechanism; clamping; steam lines; need of specifications. (E19, W19m, 1-52)

93-E. (German.) **Purpose and Effect of the Riser.** Werner Tenner. *Giessereitechnik,* v. 3, Aug. 1957, p. 186-188. (E22q)

94-E. (Russian.) **Technological Processes and Mechanization of Heavy, Cast Iron Machine Parts in "Kolomensk" Plant for Heavy Machinery Construction.** B. V. Knorre. *Liteinoe Proizvodstvo,* no. 9, Sept. 1957, p. 4-11.

Casting technique for machine parts 85 tons in weight and 15 meters long. (E general; CI)

95-E. (Russian.) **Cast Iron With Magnesium.** S. F. Gorbunov and M. M. Levitan. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 8-10.

(E25q; CI-r, *Mg,* AD-p37)

96-E. (Russian.) **Production of Large, Cast Iron Machine Parts Using Forced Air Cooled Molds.** I. V. Mitichev, *Liteinoe Proizvodstvo,* no. 9, Sept. 1957, p. 11-16.

(E general, W19g; CI)

97-E. (Russian.) **Control and Adjustment of Basic Process of Cupola Melting.** N. L. Sobol. *Liteinoe Proizvodstvo,* no. 9, Sept. 1957, p. 16-19. (E10a)

98-E. (Russian.) **Magnesium Modification of Pig Iron of Low Sulphur Content Melted in a Basic Cupola.** G. I. Kletskin. *Liteinoe Proizvodstvo,* no. 9, Sept. 1957, p. 21-26.

Method of introducing Mg into pig iron; influence of sulphur contents upon Mg addition effect; characteristics of the cupola and the basic lining; optimum conditions for basic melting. (E10a; CIa, Mg, AD-a)

99-E. (Russian.) **Experimental Application of Quick-Hardening Binding Materials to Fast Preparation of Casting Molds and Cores.** V. A. Sokolova. *Liteinoe Proizvodstvo,* no. 9, Sept. 1957, p. 26-30.

Application of water glass and special hardeners in sand technology. (E18n)

100-E. (Russian.) **Main Paths of Progress of Soviet Foundry Industry.** *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 1-4.

(E general)

101-E. (Russian.) **Operation of Furnaces With Regulated Selection of Gases Through Forehearth.** G. G. Shepel. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 5-8.

Iron casting methods used in small foundries manufacturing spare parts, so as to enhance the alloying, antifriction and toughening qualities of product. (E10; CI)

102-E. (Russian.) **Densification of Ingot Molds Through Compression, Vibro-Compression and Vibration.** L. E. Komarov. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 10-15.

Method is applicable to ingot molds of most varied dimensions and configurations. (E11, W19c, 17-57; CI)

103-E. (Russian.) **Nonmetallic Inclusions in Magnesium Iron.** A. E. Krivoschev and I. E. Lev. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 18-20.

Desulphurizing effect of Mg in cast iron.

(E general, 9-69; AD-a, *Mg,* CI)

104-E.* (Spanish.) **Production of Low-Carbon Steel Parts by the Shell Molding Process.** Jose M. Navarro and Howard F. Taylor. *Instituto del Hierro y del Acero,* v. 10, July-Sept. 1957, p. 253-277.

Influence of system of runners and sprues on surface defects in low-carbon steel parts; effect of chemical additions. Parts of 2.5 cm. section were found to be more sensitive to pouring speed and location of gates than parts of 1.25 cm. section. Addition of sodium, potassium and calcium carbonates to molds greatly improved surface quality of parts not thicker than 1.25 cm. Shell molds containing inorganic binders produced parts free of surface defects. 7 ref. (E19c, E22; 9-71; CN-g)

105-E. Shell Cores for High Production. *Canadian Metalworking,* v. 20, Nov. 1957, p. 37-38.

Introduction of plastic coated, blown shells, which provide an improved internal finish and detail of castings, is making baked solid cores obsolete for production runs. (E19c, E21g)

106-E.* Compressed-Air Risers. D. R. Kononow. *Iron and Steel,* v. 30, Oct. 1957, p. 489-491.

Application of compressed air to riser feeding of steel and gray iron castings. Effects on casting yield, tensile properties, impact properties, elongation and reduction of area of castings; dimensions and pressure for risers.

(E22q, Q general, ST, CI-n)

107-E.* Literature Review of Metal Penetration. A. E. Murton and S. L. Gertsman. *Modern Castings,* v. 33, *American Foundrymen's Society, Preprint No. 58-12,* Jan. 1958, p. 37-42.

Five investigations of metal penetration into foundry molds and cores indicate that an absolute remedy has not been found but good foundry practices minimize the problem. 13 ref. (E11, E18)

108-E.* Hot Deformation of Molding Sand. H. W. Dietert and T. E. Barlow. *Modern Castings,* v. 33, *American Foundrymen's Society, Preprint No. 58-6,* Jan. 1958, p. 43-47.

Study of the deformation of sand as it is heated by molten metal. Means of measuring hot deformation, the use of these measurements, methods for increasing rate of deformation. (E18r)

109-E. New Foundry Sand. Gilbert S. Schaller. *Modern Metals,* v. 13, Oct. 1957, p. 82-86.

Production of 85,000 castings per month from Alcan No. 135 and Alcan No. 236 Al alloys with molds of Northwest olivine. Advantages of olivine over silica as molding sands. (E18; Al)

110-E. (Russian.) **Progress and Perspective of Steel Casting Production in Heavy Machine Construction.** I. R. Kryanin and P. F. Vasilevskii. *Vestnik Mashinostroeniya,* v. 37, Dec. 1957, p. 28-32.

(E general; ST)

F Primary Mechanical Working

30-F. (German.) **Forging Technique.** Otto Kienzle and Kurt Lange. *VDI Zeitschrift,* v. 99, Aug. 1957, p. 1197-1199.

Literature review. 47 ref. (F22)

31-F.* (Portuguese.) **Characteristics of Cold Rolled Thin Sheet Steel Manufactured by Cia. Siderurgica Nacional.** Sylvio E. Friedrich. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, July 1957, p. 245-266.

Cold rolling practice at Volta Redonda Works, only Brazilian producer of cold rolled sheet; types of steel used and requirements for subsequent deep drawing; control methods and use of metallographic tests; desirable characteristics of sheet for enameling and other special applications; finishing operations. 5 ref. (F23, 1-67; ST, 4-53)

32-F. Roll Pass Design for Combination Structural and Wide Flange Beam Mill. Herman E. Muller. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 85-98.

Inland has successfully combined rolling of wide flange beams with the units that comprised their standard mill facilities; modernization of existing 28-in. structural mill has been completed and procedures developed for producing salable sections; methods of rolling and roll design were interwoven with the mill modernization program.

(F23, W23k, 17-51; ST)

33-F. Greater Flexibility for Wire Drawing. Maurice A. Nye and Robert C. Suttle. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 98-109.

Individual generators and electronic regulators provide high speeds in excess of 4000 ft. per min. at Steel Co. of Canada's new Parkdale works. (F28, W24; ST)

34-F. Modern Rod and Merchant Mill. W. R. Potts and R. M. Lang. *Iron and Steel Engineer,* v. 34, Dec. 1957, p. 161-172.

Layout, design and equipment at Atlantic Steel Co., Atlanta, Ga. (F27, W23d, 18-67; ST)

35-F. Automatic Strip Control. *Metal Industry,* v. 91, Dec. 6, 1957, p. 475-476.

(F23, ST, 18-74; 4-53)

36-F. Wrought Titanium. J. R. Crane. *Metal Industry,* v. 91, Dec. 6, 1957, p. 483-484.

Wire production; extrusion; tube production; joining.
(F24, F26, F28, K general; Ti)

37-F.* Heavy Press Forgings for Aircraft. E. C. Wright. *Metal Progress,* v. 72, Dec. 1957, p. 105-110.

Hydraulic presses of 35,000 and 50,000-ton capacity make Al forgings of record size. However, the higher pressures produce the smaller forgings to much closer dimensional tolerances, thus reducing weight of forgings one-half and final machining time to one-eighth.
(F22, W22p, 1-2; Al)

38-F.* Larger Precision Titanium Forgings. J. J. Russ. *Metal Progress,* v. 72, Dec. 1957, p. 136. (Digest from "Present Limitations and Future Possibilities in Titanium Forgings", ASM Titanium Conference, Los Angeles, Mar. 25-29, 1957.)

In comparing Ti and 4130 steel for the production of semi-precision and precision forgings it is found that Ti parts are restricted to two-thirds the size of steel forgings; internal and external draft angles must be greater for Ti, minimum rib widths and corner radii should be slightly greater in Ti as should minimum fillet radii. (F22, 17-51; Ti)

39-F. (Czech.) **Examples of Rolling Mill Equipment Standardization.** Josef Vanicek. *Hutincké Listy,* v. 12, Oct. 1957, p. 887-880.

Standards for two and three-roll mills producing ingots and sections.
(F23, W23, S22; ST)

40-F. (German.) **Methods Used in Measuring the Characteristic Data in Rolling Blooms. Pt. 1.** Hans Günter Müller and Hans-Jürgen Marx. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1577-1582.

6 ref. (F23, W23a, 4-52; ST)

41-F. (German.) **Forces Encountered in Rolling Blooms. Pt. 2.** Hans Günter Müller and Werner Lueg. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1583-1593.

5 ref. (F23, W23a, 4-52; ST)

42-F.* (Russian.) **Influence of the Shape of the Skelp Edges on the Seam Strength of Welded Tubes.** E. M. Tsigankov. *Stal',* v. 17, Aug. 1957, p. 728-730.

Investigation of tube welding with the skelp edges cut at different angles. The tubes with right angle skelp edges are the best. (F26p)

43-F. Extrusion Press Tooling. Pt. 1. Press Operation. Richard Baugh and John Lyons. *Light Metal Age,* v. 15, Dec. 1957, p. 19-20.

Explores problems to improve the techniques of producing high-quality 6063T5 Al extrusions when circle size approaches 85% of container size. (F24; Al)

44-F.* Influence of Extrusion Variables and Alloying Additions on the Grain-Size and Structural Stability of Extruded Lead. J. M. Butler. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 145-154.

Influence of extrusion temperature, speed and extrusion ratio on the grain-size of air-cooled and water-quenched commercially pure lead rods and pipes. Effect of small additions of Sb, Cu and Sn; resistance to grain growth at various temperatures of these extruded products measured. Stability of the extruded structure shows a dependence on alloying behavior and is related to the original grain size of the alloy. 6 ref. (F24, N3; Pb)

45-F.* How Iron Affects Forgeability of Copper Alloys. C. H. Hannon. *Iron Age,* v. 180, Nov. 7, 1957, p. 125-127.

Effects of iron additions, pouring temperature, cooling rate and silicon content on hot forgability and microstructure of ingots of copper alloy containing Al, Ni and Si.
(F22, 17-52, 2-60, M27; Cu, *Al, Ni, Si*)

46-F. Forgeability Tests: Are the Results Reliable? P. M. Unterweiser. *Iron Age,* v. 180, Nov. 14, 1957, p. 153-156.

Forgability and forgability tests; flow stress, ductility, friction coefficient and other factors in the study of forgability. (F22, 17-52, 1-54)

47-F.* Planetary Hot Mill. D. McQueen Potter. *Iron and Steel,* v. 30, Oct. 1957, p. 475-482.

Details of new Sendzimir hot planetary mill; operations whereby single pass reductions of more than 90% are made in hot rolling strips of mild alloy or stainless steels giving tolerances comparable to cold rolling and good surface finish. (To be concluded.) 10 ref.
(F23, 1-66, 1-52; AY, SS, 4-53)

48-F. Planetary Hot Mill. D. M. Potter. *Iron and Steel,* v. 30, Nov. 1957, p. 587-590.

Operation of Sendzimir hot planetary rolling mill. Comparison of mechanical properties of strip rolled from rimming steel slabs by planetary mill or by conventional mill as hot rolled and after subsequent cold rolling. (Conclusion.)
(F23, 1-66; ST, 4-53)

49-F. Continuous Rolling. Z. Wusatowski. *Iron and Steel,* v. 30, Nov. 1957, p. 609-610.
(F23, 1-61; ST)

50-F. Lubrication in Wire-Drawing. Pt. 2. J. G. Wistreich. *Wire Industry,* v. 24, Nov. 1957, p. 1027-1029, 1046.

Factors affecting flow of soap powders. 16 ref. (F28, 18-73)

51-F. Mechanical Descaling and Drawing of Mild Steel Rod. L. Marsden. *Wire Industry,* v. 24, no. 287, p. 1039-1046.

(F27, L10, 4-61; CN)

52-F. (Russian.) **Forging in the Uralmashzavod.** I. S. Kvater. *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1957, p. 72-76.

(F22)

53-F. (Russian.) **Utilization of Reserve Friction Forces on Blooming Mill Rolling.** B. P. Bakhtinov. *Stal',* v. 17, Sept. 1957, p. 805-809.

Use of reserve friction forces in blooming mill operation leads to a considerable increase of efficiency.
(F23n, 4-52; ST)

54-F. (Russian.) **Influence of Cold Rolling Upon Properties of 8% Chromium Steels.** V. G. Dyakov. *Stal',* v. 17, Sept. 1957, p. 837-840.

7 ref. (F23, 1-67; SS, *Cr*)

G Secondary Mechanical Working

Forming and Machining

33-G.* (German.) **Gas Cutting in Modern Production.** H. Christoph. *Schweissen und Schneiden,* v. 9, Oct. 1957, p. 441-447.

Physico-chemical fundamentals; increasing the efficiency of electrical machinery manufacture by use of flame cutting; effect of design of cutting machine; control of cutter head, shape of nozzle; nature of the fuel gas on cutting accuracy. 5 ref.
(G22g)

34-G. (German.) **Progress in Stamping Technique.** Hans Krause-Dietering. *VDI Zeitschrift,* v. 99, Sept. 1, 1957, p. 1218-1220.

Influence of sharp and dull cutting edges, sheet tenacity, tool surfaces and lubrication; data for designing and manufacturing dies. 8 ref. (G3, W24n)

35-G. (German.) **Fabrication of Hollow Bodies.** Fritz Singer. *VDI Zeitschrift,* v. 99, Sept. 1, 1957, p. 1223-1226.

Modern methods and machines; use of heat resistant and high-tensile alloys.
(G1, G9, G11, W24g; SS, AY, SGA-h)

36-G. (Japanese.) **Sintered Carbide Face Milling Cutters. Pt. 2 and 3.** M. Okoshi and N. Shinozawa. *Scientific Research Institute, Reports,* v. 33, July 1957, p. 185-208.

Power consumption and cutting force with double radial rake.
(G17b)

37-G. (Japanese.) **Surface Finish in Fine Turning.** M. Okoshi, T. Sato and A. Kamogawa. *Scientific Research Institute, Reports,* v. 33, July 1957, p. 209-227.

Surface finish in relation to cutting conditions, tools, materials and machine vibration. (G17a)

38-G. (Russian.) **Influence of Hardness and Microstructure of Alloy Castings on Their Machinability.** N. P. Golubkov. *Stanki i Instrument,* v. 28, July 1957, p. 22.

By investigating cutting speeds of various castings a formula was worked out for determining the rate of cutting for given ranges of hardness. (G17k, 5-60)

39-G. (Russian.) **Anti-Galling Drawing Compound for Steel Products.** S. A. Valiev. *Vestnik Mashinostroeniya,* v. 37, June 1957, p. 38-39.

Iron hydroxide in powder form has excellent qualities of dispersion and covers metallic surfaces readily.
(G4; NM-h)

40-G. Automation in Roller Bearing Manufacture. *Industrial Finishing, (London),* v. 9, Nov. 1957, p. 927-929.

Tapered roller bearings of Ni alloy steel are given a precision finish by grinding operations on automatic production lines at British Timken Ltd. (G19, T7d; *Ni,* ST)

41-G. Metal Cutting Research. *Iron and Steel,* v. 30, Dec. 1957, p. 647-651.

Investigations into such factors as machine tools and cutting fluids.
(G17, A9)

42-G. Cutting Costs With Abrasive Belts and Abrasive Belt Machines. Thomas J. Reid. *Metal Finishing,* v. 55, Dec. 1957, p. 65-66.

(G18, W25s)

43-G.* Fabricating Techniques for Jewelry. Ralph H. Atkinson. *Metal Progress,* v. 72, Dec. 1957, p. 94-98.

Blanking, coining, stamping and pressing are the methods most used for producing jewelry shapes. These, plus soldering and finishing, are the basis of the manufacturing jeweler's craft. (G general, K7, L general, T9s; 17-7; EG-c)

44-G. Extrusion Presses and Press Installations. E. K. L. Haffner and

R. M. L. Elkan. *Metallurgical Reviews,* v. 2, 1957, p. 263-303.

18 ref. (G5, 1-52)

45-G. Peening Cuts Stresses in Plated Parts. *Product Engineering,* v. 28, Dec. 9, 1957, p. 92-93.

The peening method pounds surfaces of high-strength steel with shot to neutralize stresses caused by electroplating, especially Cr plating. Peening also prevents cracks and increases fatigue life of parts.
(G23n, L17; ST)

46-G. (German.) **Examination of Forming Processes With the Leyensetter Pendulum During the Removal of Metal.** Heinz Vogt. *Werkstatt und Betrieb,* v. 90, Nov. 1957, p. 776-784.

Cutting properties in relation to capacity for deformation, chip brittleness, structure and composition. 11 ref. (G17k, 2-60, 3-71; ST, CI)

47-G. (Russian.) **Investigation of the Effect of Carbide Irregularity on the Grindability of R18 Steel.** E. I. Feldshtein, N. P. Lebedinskii, I. V. Trush and V. S. Kazantsev. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 39-42.

Irregularity of carbide distribution affected not only the rate of metal removal but the finish of the surface as well.
(G18, 17-52; SGA-j, 6-73)

48-G. Ceramic Cutting Tools. Pt. 1. J. F. Allen. *Canadian Metalworking,* v. 20, Oct. 1957, p. 24-26.

Experiences in using ceramic tools for finishing and roughing cuts on AISI 4130 and other forged steel. (To be concluded.)
(G17; ST, SGA-j, 6-70)

49-G. Machining High-Temperature Alloys. A. B. Albrecht. *Machinery,* v. 64, Oct. 1957, p. 149-153.

High-temperature alloys are classified into ferritic, austenitic, age-hardenable and Co-base alloy groups. Composition, machinability ratings, recommended feeds and speeds, tool type and geometry for turning in roughing and finishing operations. Horsepower and coolant requirements for high-temperature alloys. (G17, G19; SGA-h)

50-G. Spark Erosion of Deep Holes on a Wickman Erodomatic Machine. *Machinery,* v. 91, Oct. 11, 1957, p. 867-870.

Features of spark machining technique used for producing long small-diameter holes in Nimonic alloys and heat resistant steels include hollow brass electrode through which dielectric fluid is pumped, rotation of electrode and controlled vibration of work table. (G24a; Ni, SS)

51-G. Forming Integrally Stiffened Wing Panels by Shot-Peening. Kenneth Sparling. *Machinery,* v. 91, Oct. 18, 1957, p. 903-906.

Cast steel shot propelled by high-velocity air jets against flat surface of integrally stiffened wing panels of 7075T6 Al to produce convex shape. (G23n, T24a; Al)

52-G. Rapid Production of Splines by Cold Rolling. M. Etzel and C. E. Kopp. *Machinery,* v. 91, Oct. 25, 1957, p. 961-962.

Cold forming of spline on outboard motor propeller shaft: advantages of process. (G11; ST)

53-G. Cold Extrusion of Steel. B. Kaul. *Machinery,* v. 91, Oct. 25, 1957, p. 963-968.

Developments in technique of forward and backward extrusion; typical shapes obtainable and various stages in production of a steel pressure tube. (G5; ST, 4-60)

54-G. A New Idea in Spark-Machining. James D. Shoemaker. *Machinery,* v. 64, Nov. 1957, p. 147-150.

Inverted electrode spindle and plastic bubble over work area containing dielectric coolant are features. (G24a)

55-G. Heavy-Duty Bending Is a Familiar Sight at Caterpillar Plant. A. W. Johnson. *Machinery,* v. 64, Nov. 1957, p. 158-159.

Plate bending. (G6, 4-53; ST)

56-G. Carbide Tooling and Single-Purpose Lathes Speed Machining of Forged Crankpins. *Machinery,* v. 64, Nov. 1957, p. 173-176.

Machining forged steel automobile crankshafts.
(G17, T6n, T21c; ST, 4-51)

57-G.* Thread Rolling May Be for You. Raymond H. Spiotta. *Machinery,* v. 64, Nov. 1957, p. 181-195.

Defines thread rolling, effects of rolling on mechanical properties, machines and dies for reciprocating flat die thread rolling, planetary thread rolling, in-feed or plunge rolling with cylindrical dies, attachments for thread rolling on screw machines and turret lathes, information on blank feeding, blank design and tolerances and production rates.
(G12)

58-G. Use of "Throw-Away" Insert Tooling in Aircraft Production. W. L. Carr. *Machinery,* v. 91, Nov. 1, 1957, p. 1045-1047.

Throw-away carbide tips have advantages of lower costs and absence of heat strain as found in brazed tools. The use of carbide tips in turning, face, and side milling operations on Ti, Al and steel aircraft components.
(G17, T6n, 6-69; Ti, Al, ST)

59-G. AC Hydroforms Sample Stampings. T. C. Barrett. *Machinery,* v. 64, Dec. 1957, p. 144-149.

(G14b)

60-G. Oldsmobile's Rocket Engine Transfer Line. Charles H. Wick. *Machinery,* v. 64, Dec. 1957, p. 156-161.

Output has been increased by new automated transfer machining line. Slower operations have been made more efficient by dividing the work between several heads and machining alternate blocks at successive stations. (G17, 18-74, T2p)

61-G. Chrysler Automates New Stamping Plant. John Nieminen. *Machinery,* v. 64, Dec. 1957, p. 188-193.

(G3, T21; 18-67)

62-G.* Forces in Brake Forming. William W. Wood. *Tooling and Production,* v. 23, Oct. 1957, p. 77-84.

Theory of brake forming and general brake forming equation. Experimental determination of forces in forming steel, Al and Cu in gages of 0.051 and 0.125 in. Correlation of theory with experimental results.
(G1, 10-51)

63-G.* Cold Forming. William E. Hoffman and G. MacF. Tuttle. *Tooling and Production,* v. 23, Oct. 1957, p. 91-122.

Reviews definition, nature of process, principles, examples and possible applications of cold extrusion, impact extrusion, cold forging, cold heading, deep drawing, swaging and thread rolling. Principles of burnishing, roller burnishing, bearingizing, ballizing, ball-broaching, turks head, rolled extrusion, spinning, tube bending roll planishing, roll forming, stretch-wrap forming, shot peening and form and spline rolling.
(G general, 1-67)

64-G. Protective Shot Peening of Propellers. Pt. 3. Fatigue and Distortion. R. F. Broderick, Lesselles and Associates, Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131273, June 1957, 109 p. $2.75.

(G23n, T24b, Q7, 9-74)

65-G. (Dutch.) **Investigation and Trial of the Electric Gouging With Carbon Electrodes.** L. Clements. *Lastechniek,* v. 23, Sept. 1957, p. 200-203.

Flame-arc gouging offers advantages. Because of the rapidity of the gouging, the temperature of the workpiece is not appreciably increased but the cooling speed is rather high in the surface of the groove. This may result in surface hardening. (G22)

66-G. British Timken's Techniques in Grinding. Britain's Automatic Factory. Pt. 3. *Metalworking Production,* v. 101, Nov. 15, 1957, p. 2044-2047.

Grinding and handling methods illustrated and compared to bearing plants in America and Russia.
(G18, T7d, 18-74)

67-G.* Taking the Guesswork Out of Grinding and Polishing With Abrasive Belts. Warren K. Seward. *Plating,* v. 45, Jan. 1958, p. 39-44.

Tracking difficulties, contact wheels, mounting the contact wheel on worn spindles, truing and dressing contact wheels and rolls, new type of contact wheel, contact wheel performance, loading and glazing, lubrication of abrasive belts.
(G18, 1-52)

68-G. Making Metal Behave. Carl F. Benner. *Tooling and Production,* v. 23, Nov. 1957, p. 69-73.

Stamping plant experiences and procedure. (G3)

69-G.* Ironing to Improve Your Product and Save Metal, Time and Money. Carter. C. Higgins. *Tooling and Production,* v. 23, Nov. 1957, p. 77-81.

Defines ironing, a cold working process; possibilities and limitations.
(G4)

70-G. (Russian.) **The Soviet Machine-Tool Industry at the 40th Anniversary of the Russian Revolution.** *Stanki i Instrument,* v. 28, Oct. 1957, p. 1-3.

(G17)

71-G. (Russian.) **Thermal Range During Surface Grinding of Metals.** A. V. Podzei, N. N. Novikov and V. E. Loginov. *Stanki i Instrument,* v. 28, Oct. 1957, p. 16-17.

Analytical method for continuous recording of thermal range in cutting area during grinding. (G18, S16)

72-G. (Russian.) **Preparation of Multiple-Setting Screws by Rolling.** R. K. Duma. *Stanki i Instrument,* v. 28, Oct. 1957, p. 22-23.

Experiments in industrial use of rolling of multiple-setting screws have resulted in 200-fold increase in production. (G12)

73-G. (Russian.) **Calculation of Force Required for Grinding and Milling Gray Cast Iron.** Yu. A. Rozenberg and L. M. Sedokov. *Vestnik Mashinostroeniya,* v. 37, Dec. 1957, p. 68-71.

7 ref. (G18, G17b; CI)

74-G. (Russian.) **Cutter Cooling by Pressurized Liquid Jets.** S. S. Chetverikov and N. N. Zdrogov. *Vestnik Mashinostroeniya,* v. 37, Dec. 1957, p. 71-75.

(G17; NM-h)

H Powder Metallurgy

11-H.* Cermets: Pt. II. Wettability and Microstructure Studies in Liquid-Phase Sintering. N. M. Parikh and M. Humenik, Jr. *American Ceramic Society, Journal,* v. 40, Sept. 1, 1957, p. 315-320.

The microstructures of polyphase, heterogeneous systems, sintered in the presence of a liquid phase, are analyzed on basis of wettability and surface-energy relations. General principles relating to primary factors affecting microstructure. Application of these principles to such diverse systems as metal-carbide, metal-glass, metal-metal show that the microstructure and distribution of the solid in liquid is primarily determined by various surface-energy relationships. A general "coalescence hypothesis" based on this work is proposed. 7 ref.
(H15, P13h, M27; 6-70)

12-H.* Activated Sintering. M. Eudier. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 5-9.

Activated sintering involves the use of a highly reactive vapor to accelerate the complete sintering of the metal particles. This process is useful not only for increasing the physical properties of sintered metal but also for accelerating the formation of homogeneous alloys from mixed powders during the sintering operation. 6 ref. (H15n)

13-H.* Production and Characteristics of Chemically Precipitated Nickel Powder. K. O. Cockburn, R. J. Loree and J. B. Haworth. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 10-24.

Processes at Sherritt Gordon Mines Ltd., Fort Saskatchewan, for leaching, Cu removal, Ni reduction. Nickel powder handling, characteristics of Sherritt Ni powder, properties and place of Ni in powder metallurgy. 11 ref. (H10, H11; Ni)

14-H.* Production and Characteristics of Chemically Precipitated Copper Powder. Vanston H. Ryan and Henry J. Tschirner. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 25-32.

Leaching, purification, reduction and powder washing, drying and crushing, types of powder produced, physical tests on Cu powders and an analysis of the physical properties of Cu powders produced at Whitaker Metals Corp., Kansas City, Mo.
(H10, H11; Cu)

15-H.* Current Developments in the Rolling of Both Ferrous and Nonferrous Powders. John D. Shaw and Walter V. Knopp. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 33-41.

Production of continuous strip from metal powders. Thickness of strip; green density of strip; sintering of green compacted strip; comparison of hot and cold rolling; effect of variables and powder rolling; properties of typical powders used in rolled strip. 5 ref. (H14j, H11)

16-H.* Fiber Metallurgy. Cord H. Sump and William Pollack. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 42-48.

Manufacture of fiber metal in sheet form. Felting and matting of metal fibers; optimum sintering temperature; tensile strength and mechanical properties of stainless steel wool. (H17; SS, 4-62)

17-H.* Superfine Iron Powders. Michael W. Freeman and John H. L. Watson. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 112-124.

Electron microscopic studies of crystal structure to determine the nature of submicron particles. 9 ref. (H11g, T11h, M26; Fe)

18-H.* Sintering of Iron-Copper-Carbon Compacts. P. Ulf Gummeson and Lennart Forss. *Metal Powder Association, Proceedings, 13th Annual Meeting,* v. 1, 1957, p. 131-137.

Factors affecting results; effect of additions on dimensional changes, hardness, rupture strength.
(H15, Q general; Fe, Cu, C)

19-H. Compacting and Sintering Characteristics of Horizons Inc., and Carborundum Co. Zirconium, and Electro Metallurgical Titanium Powders. J. R. Pekoke. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-JRP-1, May 11, 1956, 9 p. (CMA)
(H11n, H15; Ti, Zr)

20-H. Manufacture of Hafnium Metal Powder by the Hydride Process. R. N. Honeyman. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-RNH-2, Sept. 5, 1956, 4 p. (CMA)
(H10c; Hf)

21-H. Proposed System for the Manufacture of Hafnium Metal Powder by the Hydride Process. R. N. Honeyman and G. R. Kingsbury. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-RNH-3, Sept. 13, 1956, 8 p. (CMA)
(H10c; Hf)

22-H. (German.) **Physics, Processing and Testing of Powder Metal Parts.** Helmut Gsken. *Industrie Anzeiger,* v. 79, Aug. 20, 1957, p. 1003-1004.
(H general)

23-H.* Future Potentials for Powder Metallurgy of Titanium. Arthur D. Schwope. *Metal Progress,* v. 72, Dec. 1957, p. 156, 160-161. (Digest from "Present Limitations and Future Potentials of Powder Metallurgy", ASM Titanium Conference, Los Angeles, Mar. 25-29, 1957.)

The products of both the Na and Mg reduction of Ti tetrachloride have yielded fines which are relatively pure. Implications of a fine, pure powder are that the more normal powder processing techniques can be used and that thinner cross sections can be obtained in the pressed article. (H general; Ti)

24-H. (Russian.) **Analogy Between Sintered and Hot Pressed Metallo-Ceramic Materials.** M. K. Ribalchenko. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 24-27.

Both materials were tested for physical properties and yielded similar results. (H14h, H15)

25-H.* Powder Metallurgy. Technique and Applications. *Metallurgia,* v. 56, Dec. 1957, p. 271-275.

Production and testing of metal powders and the manufacture of articles from them by compaction and sintering. Included in the applications mentioned are a number of engineering components which could not be made by conventional metallurgical techniques.
(H general)

26-H. Bigger Powdered Bearings. *Steel,* v. 141, Dec. 23, 1957, p. 72.

Problem of making outsized, self-lubricating bearings solved by joining sections of powdered metal with Ag solder. (H16, K7, T7d; Ag)

27-H. Dispersed Hard Particle Strengthening of Metals. N. J. Grant and O. Preston. Massachusetts Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131221, Nov. 1956, 34 p. $1.

Theoretical aspects of hardening and strengthening; problems encountered in powder metallurgy of the various processes.
(H11; Cu, Al, Ni, Be)

28-H. Reduction Structures of Iron Powders. J. O. Edstrom. *Jernkontorets Annaler,* v. 140, no. 2, 1956, p. 116-129. (Henry Brutcher Translation no. 3886, Altadena, Calif.)

Previously abstracted from original. See item 79-H, 1956.
(H10, H11, Fe)

29-H.* (German.) **Oxidation of Pyrophoric Iron Surfaces.** Friedrich Erdmann-Jesnitzer and Gunter Wieghardt. *Werkstoffe und Korrosion,* v. 8, Nov. 1957, p. 669-673.

Storage of powdered pyrophoric iron under commercial nitrogen does not decrease tendency to oxidize. Decrease of pyrophoric characteristic is due to traces of oxygen present in the nitrogen which causes formation of an oxide layer. 8 ref.
(H11q; Fe)

30-H.* (Italian.) **Some Fundamental Aspects of Powder Metallurgy.** Giovanni Baralis. *Ingegneria Meccanica,* v. 6, Oct. 1957, p. 25-33.

Review of principal methods of producing metal powders and their most important applications; factors influencing properties of powders and quality of objects made from them; perspectives for powder metallurgy. (H general)

31-H.* (Italian.) **Powder Metallurgy. Pt. 1. What Powder Metallurgy Is.** Neri Corsini. *Rivista di Meccanica,* no. 171, Oct. 12, 1957, p. 7-12.

Origin and development of powder metallurgy; applications in production of structural machine parts. (To be continued.) (H general)

32-H. High Density Boosts Strength. *Chemical and Engineering News,* v. 36, Jan. 13, 1958, p. 45-46.

New process uses special powders to make iron and steel powder parts with higher density. (H general; Fe)

33-H.* (Italian.) **Manufacture of Hard Metal Under Absolute Vacuum.** *Macchine,* v. 12, Oct. 1957, p. 1027-1037.

Process used by Continental Tool Co., Arnhem, Germany, for production of its new product "Sintronic".
(H general, 1-73; EG-d)

34-H. (Russian.) **Pressing and Sintering of Cermet Compositons Containing Copper.** T. N. Znatokova and V. I. Likhtman. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 511-518.

Process of pressing and sintering of copper-graphite, copper-tin and copper-tin-graphite compositions. 11 ref. (H14, H15; Cu, Sn, 6-70)

35-H. (Book.) **Metal Powder Association, Proceedings, 13th Annual Meeting,** v. 1, 1957, 147 p. Metal Powder Association, 130 W. 42nd St., New York 36, N. Y.

Collection of 16 papers read at Chicago, Apr. 30 to May 1, 1957 covering theory, practice and applications. Each paper abstracted separately.
(H general)

J Heat Treatment

42-J. Influence of Precipitation Hardening Heat Treatment on the Hardness of Several Uranium-Molybdenum Alloys. T. I. Jones, et al. Los Alamos Scientific Laboratory. *U. S. Atomic Energy Commission,* LA-1715, 83 p. (CMA)

4 ref. (J27a, Q29n; U, Mo)

43-J. (German.) **Induction Heating of Ferromagnetic Materials.** J. Minssieux. *Deutsche Elektrotechnik,* v. 11, Aug. 1957, p. 381-383.

Theory, application and equipment for surface hardening of steel. (J2g; ST)

44-J. (German.) **Hardening.** Walter Stuhlmann. *VDI Zeitschrift,* v. 99, Aug. 1957, p. 1202-1205.

Literature review. 27 ref. (J general)

45-J.* Nitriding of Large Forgings. C. W. Johnson. *Metal Progress,* v. 72, Dec. 1957, p. 99-101.

Large crankshafts for diesel engines, forged and completely machined, are nitrided by National Forge & Ordnance Co. As has been demonstrated for aircraft engine crankshafts, the nitrided surface (being in compression) notably increases fatigue strength and endurance, as well as wear. (J28k; AY, 4-1)

46-J.* Annealing of Steel Sheet. G. W. Form and E. B. Evans. *Metal Progress,* v. 72, Dec. 1957, p. 111-112, 142.

While batch annealing takes hours, the product is softer and more desirable for deep drawing than that from the rapid continuous annealing. "Snakes" (a ripply surface) are suspected to be subsurface oxides, and they form even when the standard D-X atmosphere is maintained during annealing. Directional orientation of microstructure and strain aging characteristics are still matters which require correction in tonnage mill products. (J23; Cn, 4-3)

47-J.* How to Make Invar Stay Put. Warren S. Eberly. *Product Engineering,* v. 28, Dec. 9, 1957, p. 80-81.

Special heat treatments to stabilize dimensions and themal coefficients. This coefficient value reaches a minimum at 36% Ni and increases rapidly with small changes in Ni content. Nickel must be held between 35.5 and 36% to assure consistent behavior in service. (J23q, P10d, P11, 2-60; Ni)

48-J. Effect of Heat Treatment on the Structure of A2 Cold Work Die Steel. Pt. 41. R. F. Harvey. *Steel Processing and Conversion,* v. 43, Dec. 1957, p. 696-697.

(J22, J29; TS)

49-J. Modern Quenching Techniques. O. E. Cullen. *Steel Processing and Conversion,* v. 43, Dec. 1957, p. 700-701, 704, 708-709.

(J26; ST)

50-J. (English.) **Effect of Isothermal Magnetic Annealing on the Magnetic Properties of Nickel-Cobalt Alloys at Room Temperature.** Hakaru Masumoto, Hideo Saito and Minoru Takahashi. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Oct. 1957, p. 374-394.

3 ref. (J23s, P16b; Ni, Co)

51-J. (German.) **End Quenching Test for Flame-Hardening Steel Castings.** Hans Wilhelm Grönegress. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1619-1623.

Determination of hardness depth; effects of preheating, quenching temperature and type of heating. 6 ref. (J5, J2h; ST, 5-60)

52-J. (Russian.) **Maximum Temperature Interval Between Forging and Heat Treatment of Large Shafts Made of Al-Mn Bronze No. 9-2.** N. N. Popova and N. A. Kravchenko. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 28-33.

Macroscopic examination of various ingots for pump shafts disclosed that forgings may be made free of defects as long as the work is kept within the required temperature range. Maximum heat interval was determined to be 900-800° C. 4 ref. (J general, 4-51; *Al, Mn,* Cu)

53-J. (Russian.) **Rapid Cyanidation by Heating With High-Frequency Current.** A. S. Barshcheva and V. S. Gnuchev. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 48-50.

The soluble salt process can be readily mechanized so that hundreds of parts may be treated in 1 hr. Thickness of cyanided layer varies between 0.02 and 0.06 mm. and its hardness may be as high as 60 R_c. (J28j, 1-69; ST)

54-J.* (Russian.) **Elimination of Local Brittleness in Iron Plate.** M. V. Pridantsev and E. V. Smirnov. *Stal',* v. 17, Aug. 1957, p. 736-740.

To eliminate local brittleness of iron plate caused by oxidation during annealing, it is essential to anneal the plate at 900-950° C. in an inert, dry atmosphere such as hydrogen or dissociated ammonia. 3 ref. (J23a, Q26; Fe, SGA-n)

55-J.* (Russian.) **Experimental Application of Protective Atmosphere.** S. A. Kulikovskii, A. N. Kalyuzhnii, M. M. Bart and B. Ya. Zeilikovich. *Stal',* v. 17, Aug. 1957, p. 740-744.

A protective atmosphere of producer gas containing 7-9% CO in bell-type furnace for bright annealing eliminates or considerably reduces subsequent pickling time of iron sheets. (J23a; Fe, SGA-n)

56-J. Induction Heating and Its Applications in the Metal Working Industry. Gerhard Seulen. *AEG Progress,* v. 3, 1957, p. 93-99.

Induction heating as an aid to automation of production in foundries and forges; advantages in hot forming, surface hardening, soldering and annealing operations. (J2g, F21b, 1-69, K7e, 1-52)

57-J. Application of Furnace Atmospheres. Pt. 1. C. E. Peck. *Industrial Heating,* v. 26, Nov. 1957, p. 2268-2280.

(J2k; ST)

58-J. Advantages of Fast Quenching and Common Misconceptions. Frank M. Aldrich. *Industrial Heating,* v. 11, Nov. 1957, p. 2301-2304.

(J26p; ST)

59-J. Heat Treatment of Transmission Gears. *Machinery,* v. 91, Oct. 18, 1957, p. 920-922.

Note on arrangement and operations of gas carburizing, salt-bath carburizing and induction hardening line for processing 1000 lb. of commercial vehicle transmission gears every 7 hr. (J28g, J2g, J2j, T21c; ST)

60-J.* Vocabulary of Heat Treatment. G. R. Morton. *Metal Treatment and Drop Forging,* v. 24, Dec. 1957, p. 481-490.

Fundamentals of the heat treatment of steel and the precise meaning of the various terms. Effect of structure on mechanical properties. 8 ref.

(J general, Q general, 3-71, 11-67; ST)

61-J. Single Stack Annealing Gets the Nod. Howard E. Miller. *Steel,* v. 141, Nov. 11, 1957, p. 118-126.

Compares results of annealing coiled cold rolled steel strip in single and multiple stack furnaces at Republic Steel. (J23, W27, 4-53; ST)

62-J. Salt Bath Free Fall Quench Cuts Distortion. *Western Metals,* v. 15, Oct. 1957, p. 46-47.

Formed Al aircraft parts are heat treated in nitrate salt baths at 950° F. and water quenched by free fall method to minimize distortion. (J26n, J2j; Al)

63-J. Continuous, Rapid Heat Processing Makes High Strength, Seamless Oil Tubing. *Western Metals,* v. 15, Oct. 1957, p. 57-60.

Operation and work flow on continuous line consisting of series of radiant gas-fired chambers and quenching and tempering units for heat treatment of seamless carbon steel pipe. (J26, W27g; ST, 4-60)

64-J. (German.) **Developments in Magnesium Industry.** A. Hohmann. *Giesserei Praxis,* v. 75, Nov. 10, 1957, p. 476-478.

Modern heat treatment for Mg alloys, Mg in nodular graphite cast iron. (J general, E25q; Mg, AD-p37)

65-J.* (Spanish.) **Experimental Study of Some Factors Which Affect the Quality and Depth of High-Frequency Induction Surface Hardening in Carbon Steels.** Miguel P. de Andrés Sanz. *Instituto del Hierro y del Acero,* v. 10, July-Sept. 1957, p. 320-354.

Macro and micro examination, as well as microhardness tests, of Spanish-made carbon steels after hardening, defined surface, intermediate and center layers and basic metallurgical characteristics of these layers. By systematic study of successive structures it was possible to determine stages of mechanism of progressive austenitizing and explain process of surface hardening. Initial structure was found to influence hardenability of specimens. Depth of layers and total modified structure were studied as function of heating times and power consumption. (J5, J2g, N8; CN)

66-J. (Russian.) **Industrial Use of Quick Induction Heating.** M. G. Lozinski. *Vestnik Maschinostroeniia,* no. 11, Nov. 1957, p. 66-75.

Method of quick chemical-thermal treatment of steel in machine building. (J2g; ST)

67-J.* Production of Ferrite in Spheroidal Graphite Cast Iron by Heat-Treatment. John Gittus. *Iron and Steel,* v. 30, Nov. 1957, p. 603-607.

Investigation of possibility of modifying the usual 2 to 8 hr. at 850 to 900° C. and 4 to 12 hr. at 690 to 720° C. annealing processes used for changing pearlitic matrix of spheroidal graphite iron castings to ferritic matrix with greater ductility and shock resistance. Effect of elimination of first stage annealing on structure of ferrite formed and effect of Si-Mn, P, Ni and Cu on structure produced by various second stage anneals. Compares rates of graphitization and the structures produced by first stage annealing in Mg-bearing and Mg-free irons

containing eutectic carbides. Influence of Si, Ni, Cr, Mn and Mo content on the tendency for eutectic carbides to be produced during solidification and the facility with which they can be graphitized at 900° C. (To be concluded.) 5 ref.
(J23, N8s, 1-60; CI-r)

68-J* Hardenability of Pearlitic Malleable Iron. R. W. Heine. *Modern Castings*, v. 33, *American Foundrymen's Society, Preprint* No. 58-20, Jan. 1958, p. 48-52.

Report of AFS Pearlitic Malleable Committee presents end-quench hardenability curve data. Information is given to aid purchaser or user of castings to apply final heat treatment. 3 ref. (J5; CI-s)

69-J. (German.) **Rotary Hardening of Gears.** Frank J. Overkott. *Werkstatt und Betrieb*, v. 90, Aug. 1957, p. 501-507.

Principles of rotary hardening and important factors including steel composition, gear form, tooth profile, tooth width, tooth number, hardening method, hardening temperature, burner design, number of burners, gas compositon and oxygen consumption in flame hardening, heating time, quenching media and method, their effects on distortion, hardness values, and microstructure of the workpiece. (J2h, T7a; ST)

70-J. (Russian.) **Tempering of Surface Hardened Parts by Induction Heating.** Yu. M. Bogatirev and S. M. Gamazkov. *Metallovedenie i Obrabotka Metallov*, v. 1, Sept. 1957, p. 51-58.

7 ref. (J29, J2g; ST)

71-J. (Russian.) **Treatment of Large Forgings.** N. V. Fiksen. *Metallovedenie i Obrabotka Metallov*, no. 11, Nov. 1957, p. 77-80.

Shortening of time needed for heat treatment through modernization of furnaces increased productivity by 30% and reduced fuel consumption by 10%. (J general, W27, 4-51; ST)

72-J. (Russian.) **Heat Treatment of Low-Carbon Steel.** N. V. Shmidt, Z. N. Krasilshchikov, N. T. Pavlenko and I. N. Shvach. *Stal'*, v. 17, Sept. 1957, p. 833-837.

Heat treatment process by which properties can be upgraded to be equal to the properties of low-alloy steel. 6 ref.
(J general; CN-g, AY-b)

K Assembling and Joining

55-K.* New Semiconductor Bonding Technique. *Electronics Technician*, v. 66, Sept. 1957, p. 71.

Thermo-compression bonding, developed at Bell Telephone Labs, utilizes heat and pressure to provide firm bond between various soft metals and clean, single crystal semiconductor surfaces. (K6, T1k)

56-K.* Metal-Arc Welding of Mild Steel Plates. Avoiding Difficulties. R. S. Bolton. *Iron and Coal Trades Review*, v. 175, Sept. 6, 1957, p. 557-562.

Materials, electrodes, welding procedure and inspection of welds.
(K1; CN, 4-53)

57-K. Designing Low Cost Weldments. John Mikulak. *Machine Design*, v. 29, Sept. 19, 1957, p. 135-140.
(K general, 17-51)

58-K. Joining of Zircaloy-2 to Austenitic Stainless Steel. Report No. 1. K. H. Koopman and O. F. Kimball. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission*, KAPL-M-KOK-1, July 31, 1956, 30 p. (CMA)

Welding, brazing and cladding were studied in an attempt to join Zircaloy-2 to stainless steel. The formation of brittle intermetallic compounds with Zr is the main difficulty. 3 ref. (K1, K8, L22; Zr, SS)

59-K. Fabrication of a Titanium Tube Heat Exchanger. R. W. Wirta. Hanford Works. *U. S. Atomic Energy Commission*, HW-51998, Aug. 20, 1957, 31 p. (CMA)

Gas embrittlement caused a prototype Ti tube heat exchanger to crack at the weld. Micrography revealed gross oxygen contamination of the weld metal. In making a second heat exchanger, a glove box welding method was used successfully to weld Ti tubes to the Ti sheet facings. (K1, W13b; Ti)

60-K. (French.) **Recent Improvements in the Technique of Welding and Gas Cutting.** J. Boussard. *La Pratique des Industries Mecaniques*, v. 40, Sept. 1957, p. 233-241.

Arc welding, inert arc welding, resistance welding and supersonic welding. (K1, K3, K6)

61-K. (German.) **Induction Soldering.** Erich Kolbe. *Deutsche Elektrotechnik*, v. 11, Aug. 1957, p. 371-372.
(K7e)

62-K. (German.) **Resistance of Sheet Metal Welds to Strain Aging.** Siegfried Förster, Werner Rauterkus, Herbert Thielmann and Fritz Thyssen. *Schweissen und Schneiden*, v. 9, Oct. 1957, p. 447-457.

Characteristics of various welding processes; selection of electrodes.
(K general, N7e; 4-53; CN, ST, *Mn*)

63-K.* (German.) **Metallurgical Importance of the Arc in Machine Welding.** W. Mantel and L. Wolff. *Schweissen und Schneiden*, v. 9, Oct. 1957, p. 457-460.

Melting and penetration with regard to welding at the positive and negative electrodes; auxiliary agents for welding with base electrodes by alternating current arc; effect of the arc on the melting pool and the parent metal; control mechanisms.
(K1g, K9n, W29)

64-K. (German.) **Problems of Welding Structural Steels of High Tensile Strength.** H. J. Wiester. *Schweissen und Schneiden*, v. 9, Oct. 1957, p. 465-468.

Nitrogen content; weldability of basic bessemer steels; aging conditions. 18 ref.
(K9s; 2-65, 3-68; ST-g, SGB-s)

65-K. (German.) **Contractions, Contraction Tensions and Tolerances in Welded Construction.** Hans J. Machill. *VDI Zeitschrift*, v. 99, Aug. 1957, p. 1189-1190.
(K general, 17-51)

66-K. (German.) **Welding and Cutting.** Alexander Matting. *VDI Zeitscrift*, v. 99, Aug. 1957, p. 1199-1202.

Literature survey. 75 ref.
(K general, G22g)

67-K. (Italian.) **Inert-Gas Consumable-Electrode Arc Welding of Aluminum.** Giuseppe Foti. *Rivista Italiana della Saldatura*, v. 9, July-Aug. 1957, p. 153-162.

Description of technique, its advantages and drawbacks; applications in Italy in construction of ships and pressure vessels, and in cold rolling mills for joining Al strip. (K1d; Al)

68-K. (Spanish.) **Factors in Productivity of Welding.** Othmar Schmidt. *Ciencia y Tecnica de la Soldadura*, v. 7, Sept-Oct. 1957, 7 p.

Factors influencing productivity of manual electric arc welding in plant where specialty is not welded construction but certain types of machinery. Knowledge of steels, electrodes, welding apparatus, preparation of work, design, tools, contraction phenomena. (K1; ST)

69-K. (Spanish.) **Assembly of Motorcycle Frames: Several Solutions to This Problem.** Ernest Demaret. *Ciencia y Tecnica de la Soldadura*, Sept-Oct. 1957, 9 p.

Welding techniques applicable to manufacture of two-wheel vehicles and specific uses of each. 12 ref.
(K general, T10h; ST)

70-K. (Spanish.) **Influence of Welding on Metal Structures.** C. Penche Felgueroso. *Ciencia y Tecnica de la Soldadura*, v. 7, Sept-Oct. 1957, 12 p.

Advantages of metal structures over concrete, and of welded joints over other types. Three types of structures, isostatic, rigid and semirigid, considered, from point of view of stress and load factors, as well as design factors, convenience of execution of joints, etc.; examples.
(K general, T26)

71-K. Science and Technique of Welding in the Soviet Union. N. N. Rykalin. *British Welding Journal*, v. 4, Dec. 1957, p. 541-547.

Submerged-arc welding is most commonly used, and a wide variety of equipment has been developed. Electro-slag process for the single-pass welding of thick plates or slabs. Widespread use of alternating current for welding in the U.S.S.R. 7 ref. (K general)

72-K.* Projection Welding of 24 S.W.G. Mild Steel. J. E. Roberts and G. A. Phipps. *British Welding Journal*, v. 4, Dec. 1957, p. 557-563.

Experimental technique used to determine optimum welding conditions for single, double and triple projection welds. Selection of the welding conditions has been made by the examination of mean strength, consistency and surface appearance. 4 ref. (K3q; CN)

73-K. (Italian.) **A Case of Improper Welding.** Eugenio Hugony. *Ingegneria Meccanica*, v. 6, Sept. 1957, p. 7-8.

Analysis of fragment of turbine blade in 18-8 stainless showed that defective casting has been repaired with inferior materials and improper welding procedures, resulting in fracture of part during service.
(K general, 18-72; SS, 5-60)

74-K. (Russian.) **Dispersion of Carbon in the Vicinity of Welded Joints of Austenitic Steel Type 18-9.** N. V. Ulyanova and V. V. Sagalovich. *Metallovedenie i Obrabotka Metallov*, no. 7, July 1957, p. 2-7.

The carbon was traced by radioactive isotopes. Images produced by auto-radiography proved to be satisfactory for evaluating the macroscopic character of carbon dispersion in the welded joint and in the adjoining areas in this Cr-Ni Steel. 4 ref. (K9r, 1-59; SS)

75-K. Stainless Steels: Problem or Opportunity? H. J. Nichols. *Canadian Metalworking*, v. 20, Oct. 1957, p. 50-52.

Classes of stainless steels and difficulties encountered in welding.
(K general; SS)

76-K. Microcracking in Mild Steel Weld Metal. Pt. 2. *Canadian Metalworking,* v. 20, Oct. 1957, p. 58-64.

Relationship between electrode type, hydrogen content, hardness and microcracking density. Association of microcracking with different types of nonmetallic inclusions and hydrogen accumulation in flaws. 19 ref. (K1, 9-72; CN)

77-K.* Dip Brazing Magnesium. William J. Graves. *Light Metal Age,* v. 15, Dec. 1957, p. 23.

Two parent material alloys of magnesium have been successfully brazed, M1A alloy and AZ31B (FSI) alloy. The most satisfactory brazing filler alloy to date is AB125. Dow brazing flux #452 has given the best results with this filler alloy.
(K8n; Mg, SGA-f)

78-K. Welding the Lincoln Uniframe Body. M. H. Trygar and O. B. Simmons. *Machinery,* v. 64, Dec. 1957, p. 162-165.

Spot welding process. (K3n)

79-K.* Joining of Metals. *Metal Industry,* v. 91, Dec. 13, 1957, p. 495-497.

Resumé of four papers on wetting and spreading of liquid metals on solid metal surfaces which were presented recently at a conference at University of Birmingham, England.
(K9n)

80-K. Automatic Multi-Stage Projection Welding Line. E. C. Hall. *Metalworking Production,* v. 101, Nov. 1, 1957, p. 1951-1955.

Automatic feeding systems for multiple resistant welding stations.
(K3q, 1-52, 18-74)

81-K. Challenge to the Rubber Industry. Ralph Schmuckal. *Rubber Age,* v. 82, Dec. 1957, p. 478-480.

Problems involved in bonding of rubber to metal and subsequent serviceability of metal-rubber parts.
(K11c)

82-K. Trends in Metal Preparation. F. W. Gage. *Rubber Age,* v. 82, Dec. 1957, p. 480-481.

Pretreatment of metal surfaces preparatory to bonding of rubber coatings. (K11c, L10c, L12n)

83-K. Trends in Rubber-to-Metal Bonding. Howard L. Irvin. *Rubber Age,* v. 82, Dec. 1957, p. 481-482.

Present types and future requirements of adhesives and elastomers, with special reference to bonded assemblies intended for high-service temperatures. (K11c; NM-d36)

84-K. Application of Ultrasonic Energy to Cold Welding of Metals. J. B. Jones and C. F. DePrisco. Aeroprojects Inc. (Frankford Arsenal.) *U. S. Office of Technical Services,* PB 131083, Nov. 1953, 61 p. $1.75.

(K6, 1-74; EG-a38)

85-K. Ultrasonic Welding of Metals. J. B. Jones, C. F. DePrisco and J. G. Thomas. Aeroprojects Inc. (Frankford Arsenal.) *U. S. Office of Technical Services,* PB 131084, Apr. 1955, 105 p. $2.75.

(K6, 1-74)

86-K. Evaluation of Welded Joints Between AISI 347 Stainless Steel and 70-30 Copper-Nickel Alloy Tubes Under Thermal Shock Specimen No. 3. W. E. Clautice and R. W. Stevens. U. S. Naval Engineering Experiment Station. *U. S. Office of Technical Services.* PB 121877, May 1955, 49 p. $1.25.

Evaluation of emergency heat exchangers in a new type of submarine propulsion plant.
(K9r, Q10a, W13b; SS, Cu, Ni)

87-K. Strength and Corrosion Resistance of Ultrasonically Soldered Aluminum Joints. J. B. Jones and J. G. Thomas. Aeroprojects Inc. (Frankford Arsenal.) *U. S. Office of Technical Services,* PB 121965, Mar. 1956, 61 p. $1.75.

(K7h, Q27a, R general: Al, Sn, Cd)

88-K.* Study of Metallurgical Effects in the Multipass Welding of Zircaloy. *Welding Journal,* v. 37, Jan. 1958, p. 1s-9s.

Tests on a 32-pass weldment indicate that 100% joint efficiency was achieved with very slight loss of ductility through proper control of interpass temperature. The corrosion behavior of the weldment is equivalent to, or better than, that of the base metal. 12 ref.
(K9n, R general; Zr)

89-K. Development of Welding for Engineering Fabrication. J. H. Humberstone. *Welding Journal,* v. 37, Jan. 1958, p. 9-15.

History, applications and recent developments. (K general, A2, 17-57)

90-K. New Techniques in Precision-Welding Control. J. L. Solomon and M. Balikov. *Welding Journal,* v. 37, Jan. 1958, p. 16-21.

Control of function duration by counting cycles rather than timing by the use of resistance-capacity circuits. (K3)

91-K.* Effect of Preheating and Postheating on Toughness of Weld Metal. T. N. Armstrong and W. L. Warner. *Welding Journal,* v. 37, Jan. 1958, p. 27s-29s.

Postheating weld metal from seven classes of steel electrodes at 1150° F. in no instance lowered the transition temperature. Preheating at temperatures up to 600° F. improved the impact properties of E7015 carbon steel weld metal and E8015-C2 nickel steel weld metal. In no instance did preheating adversely affect the impact properties of welds from these two electrodes.
(K9p, K9q, Q6n; ST)

92-K.* Dip Brazing Aluminum With Paste Filler. A. M. Setapen. *Welding Engineer,* v. 43, Jan. 1958, p. 30-32.

New filler metal is a eutectic consisting of 88% Al and 12% Si (AWS designation BAlSi-4), and melts between 1070-1080° F. Supplied as a powder in combination with a controlled amount of a flux-cement, it is made up into an aqueous paste, coated directly onto the joint area.
(K8n; SGA-f, Al)

93-K.* Application Aids for Arc Welding Aluminum Bus. *Welding Engineer,* v. 43, Jan. 1958, p. 34-37.

Recommended practices for metal-arc welding with flux-coated electrodes; recommended practices for Tig welding aluminum; typical properties of Tig and Mig welds in aluminum bus conductor.
(K1e, T1c; Al)

94-K. Filler Metals for Joining. Orville T. Barnett. *Welding Engineer,* v. 43, Jan. 1958, p. 56-62.

Classifications, specifications, applications and properties.
(K1, S22; SGA-f)

95-K. Primary Structure and Causes of Weld Hot Cracking of Chromansil-Type Steel. S. V. Avakyan and N. F. Lashko. *Avtogennoe Delo,* v. 21, no. 10, 1950, p. 13-16. (Henry Brutcher Translation no. 3983, Altadena, Calif.)

Previously abstracted from original. See item 111-K, 1951.
(K1, M21, AY)

96-K. (Dutch.) **Silver Soldered Heating Coils in Crude Oil Tankers.** H. R. Brooker. *Lastechniek,* v. 23, Oct. 1957, p. 236-239.

For a long time fusion welded steel pipes were used as heating coils, but because of severe corrosion, the life-span was short. Aluminum-bronze pipe (76-22-2), although much higher in price, means a considerable saving to the ship owner. Silver soldering was chosen as the best joining method. Advantages include reliable joints between different metals, ability to join special Cu alloys with a strength equal to that of the parent metal, working speed and economy.
(K7; *Ag, Cu, Al*)

97-K. (Dutch.) **Manufacture of Pipelines for High Pressure and Temperature.** W. J. Kaufman. *Lastechniek,* v. 23, Oct. 1957, p. 239-242.

Increasing pressures and temperatures lead to higher percentages of alloying elements and greater thicknesses of the walls. Both factors result in higher accuracy requirements. Principal manufacturing methods, beginning with bending. Data on welding problems, subdivided into fusion, arc and inert arc. (K1, T26r, 2-62, 3-74; AY)

98-K. (Dutch.) **Production in the Welding of Pipelines.** A. J. van der Velde. *Lastechniek,* v. 23, Oct. 1957, p. 243-246.

Experience in arc welding of pipelines of unalloyed steel. Advantages and disadvantages of various methods. Speed and quality, cost and production figures. 16 ref.
(K1, T26r; ST)

99-K. (Dutch.) **Welding of Boiler Pipes.** C. Nederveen. *Lastechniek,* v. 23, Oct. 1957, p. 251-253.

Excellent results are obtained on boiler pipes 2 to 6 in. diameter of unalloyed and low-alloy steel by welding the basic seam with argon-arc and filling with coated electrodes. (K1a, K1d, 4-60; ST)

100-K. (Dutch.) **Fusion Welding in the Installation of Pipelines.** H. Jansen. *Lastechniek,* v. 23, Oct. 1957, p. 254-260.

Survey of pipe joining methods without details on pipe construction. Use of welding in pipelines and its advantages explained by example. The safety of a pipeline requires, next to the selection of the right material, a suitable form of welding, the hiring of skilled welders and thorough checking of the welds. Welding has been found to be the most modern and advantageous method. 7 ref.
(K general, T26r; ST)

101-K. (Dutch.) **Welding of Thin-Walled Tubes in the Construction of Airplanes.** N. Groenendijk. *Lastechniek,* v. 23, Oct. 1957, p. 261-264.

Materials for seamless drawn tube; welding; shrinking of the material in welding. Welding methods—fusion arc, argon-arc, brazing. Welding of light alloys; welding of Cu and Cu alloys.
(K1, K8; EG-a39, Cu, 4-60)

102-K. (Dutch.) **The "Boxed" Welding of Rails.** G. Zoethout. *Lastechniek,* v. 23, Nov. 1957, p. 274-277.

For welding on the roadbed a new process named "boxed-in" welding uses a special basic electrode (Philips 250R). The essential feature is the great supply of heat, which has a favorable influence upon the weldability of rail.
(K1; T23q; ST)

103-K. (German.) **Welding in Railroad Car and Diesel Construction.** Karl Mesnaritsch. *Schweisstechnik,* v. 11,

Oct. 1957, p. 109-116.
(K general, T23n, T23p)

104-K. Brazing Makes Metal Hose of Coiled Wire. Frederick C. Schaefer and Thomas Admerand. *American Machinist,* v. 10, Dec. 2, 1957, p. 109.

Spiral rolls are formed by feeding Cu wire with strips of Ni-Fe into winding machine. After compressing, rolls are brazed in furnace.
(K8j, 4-60; Ni, Cu, Fe)

105-K. New Methods of Testing Weldability. M. K. Shorshorov. *Canadian Metalworking,* v. 20, Nov. 1957, p. 66-68, 70-72, 80.

Three modern testing methods being used in U.S.S.R. 4 ref.
(K9s, 1-54; ST)

106-K. Tips on Welding Thick-Walled Vessels. *Iron Age,* v. 180, Nov. 14, 1957, p. 162-164.
(K1d, T26q; SS)

107-K. Vinyl Plus Aluminum. Robert G. Nau. *Modern Metals,* v. 13, Oct. 1957, p. 44-48.

Process for bonding vinyl film to Al; advantages and typical uses.
(K11d; Al)

108-K. Thick Plate Welding for Nuclear Energy Applications. *Welder,* v. 26, July-Sept. 1957, p. 66-71.

Murex Ltd., England, developed new low-hydrogen electrode to give proper impact properties.
(K1, Q6, W29h; 4-53, AY)

109-K. A Remarkable Welded Repair to a 3000-Ton Press. *Welder,* v. 26, July-Sept. 1957, p. 76-80.

Steps used in successfully repairing 12-in. thick wall of main cylinder. (K1, 18-72; CI)

110-K. Brazing for Greater Productivity. G. M. A. Blanc and Rene D. Wasserman. *Welding Engineer,* v. 42, Nov. 1957, p. 34-36.

Advantages of brazing for joining components in high production situations illustrated by several examples. (K8)

111-K. (Russian.) **Influence of Titanium and Nitrogen Upon Structure and Properties of Welded Seams in Thin High-Chromium Steel Sheet.** D. A. Odesskii and V. M. Vozdvizhenskii. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 42-46.

High-chromium steel containing 0.2% N is recommended for welding while high-chromium steel containing 0.3% Ti is not. 8 ref.
(K9s, 2-60, 4-53; SS, *N, Ti*)

112-K. (Norwegian.) **Bonding of Aluminum. Norwegian Aluminum Co.** *Teknisk Ukeblad,* v. 104, Oct. 17, 1957, p. 1-3 of attachment.

Types of synthetic resins, listing manufacturers, properties and applications. (K12; Al)

L Cleaning Coating and Finishing

69-L.* Influence of Chloride Ions on the Solution of a Nickel Anode. A. V. Pomosov and L. I. Gurevich. *Journal of Applied Chemistry of the USSR.* v. 29, Sept. 1956, p. 1475-1479. (Translated by Consultants Bureau, Inc.)

Three characteristic regions of the action of chloride ions on passivation of Ni anodes have been found. In the current density region up to 4.2 A. per sq. dm. with 0.5 g-equiv. per liter of sodium chloride in the bath, Ni anodes dissolve without hindrance; addition of 0.02-0.1 g-equiv. of chlorides per liter favors anode passivation and induces transitory (periodic) passivity. The passivating action of chloride ions is explained by the formation of hypochlorous acid in secondary reactions. 5 ref. (L17a; *Ni*)

70-L. Metal Spraying in Inert Atmospheres. R. E. Monroe, D. C. Martin and C. B. Voldrich. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI 894, 21 p.

Zirconium coatings on uranium.
(L23; *Zr,* U)

71-L. Research on the Electrodeposition of Zirconium, Niobium and Vanadium From Nonaqueous Media. A. P. Beard, D. H. Ahmann and F. J. Shipko. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-798, Aug. 22, 1952, 7 p. (CMA)

9 ref. (L17; Zr, Cb, V)

72-L. Bonding of Uranium and Zirconium Alloys. H. D. McIntire, H. J. Hucek and G. K. Manning. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-781, Oct. 23, 1953, 18 p. (CMA)

Fabricating conditions for roll cladding Zr and U alloys.
(L22; U, Zr)

73-L. Vapor Deposited Zirconium on Uranium. C. F. Powell, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1018, July 20, 1955, 30 p. (CMA)
(L25k; U, Zr, *Cr*)

74-L. (French.) **Treatment of Aluminum and Aluminum Alloys Surfaces by Electrochemical Means.** F. Flusin. *Bulletin de la Société Francaise des Electriciens,* v. 7, Sept. 1957, p. 553-560.

Pickling, polishing, anodic oxidation, cathodic oxidation.
(L19, L21, L13n, L12g; Al)

75-L. (French.) **Treatment of Superficial Structure of Metals by the "Sulfinusation" Process.** Charlotte Buckle, Robert Courte, Robert Desbrandes and Louis Pons. *Comptes Rendus,* v. 245, Sept. 30, 1957, p. 1120-1121.

Diffusion zone some tenths of a millimeter from the surface with precipitates in pearlite and ferrite.
(L15; *S,* ST)

76-L.* (Portuguese.) **Metallurgical Characteristics of Tinplate Manufactured by Cia. Siderurgica Nacional.** Pedro Silva. *ABM, Associacao Brasileira de Metais, Boletim,* v. 13, July 1957, p. 215-244.

Process details at Volta Redonda Works from rolling of ingots up to and through dip and electrolytic plating processes; characteristics and applications of tinplate produced. 5 ref. (L17; *Sn,* ST)

77-L.* New Plating Process for Corrosion and Wear Resistance. *Industrial Finishing (London),* v. 9, Nov. 1957, p. 921-926.

Chemical process (Kanigen) deposits a hard, uniform, nonporous and highly corrosion and wear resistant Ni-P alloy with a number of unusual properties. (L28; *Ni*)

78-L. American Practice in Stainless Steel Finishing. *Industrial Finishing (London),* v. 9, Nov. 1957, p. 930-934.

Compared with British practice.
(L general; SS)

79-L. Conditioning and Painting the Surfaces of Zinc Coated Steels. Lester F. Spencer. *Industrial Finishing,* v. 34, Dec. 1957, p. 28-35.

Cleaning; coating with paint, enamels and laquers.
(L12h, L26; ST)

80-L. Science for the Coatings Technologist. Pt. 8. Green Pigments. E. S. Beck. *Metal Finishing,* v. 55, Dec. 1957, p. 61-62, 66.

14 ref. (L26n)

81-L. When to Use Solvent-Vapor Degreasing. C. E. Kircher. *Metal Finishing,* v. 55, Dec. 1957, p. 63-64.
(L12j)

82-L. Metal Spraying—Development and Application. S. J. Oechsle, Jr. *Metal Finishing,* v. 55, Dec. 1957, p. 67-71, 76.
(L23)

83-L. Finishing Pointers. Unconventional Chromium Plating. J. B. Mohler. *Metal Finishing,* v. 55, Dec. 1957, p. 75-76.
(L17; *Cr*)

84-L. How to Specify Colorful, Functional, Economical and Pre-Painted Steel. Ford R. Park. *Product Engineering,* v. 28, Dec. 9, 1957, p. 99-102.
(L26n; ST)

85-L. (Italian.) **Bright Nickel-Plating: Research on the Influence of Organic Addition Agents.** Eugenio Bertorelli, Ignazio Bellobono and Corrado Bordonali. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. 1, 1957, p. 55-67.

Principal bright Ni-plating processes and theories. Results of adding to the bath organic substances of the oxy-benzaldehyde series, pyridine and acetylene derivatives. Influence of saccharine. Bright deposits are interpreted as result of intermediate formation in the cathodic adsorption film of a particular type of activated compound which favors deposition of nuclei smaller than length of a light wave. Effect of saccharine is explained as homogenization of adsorption film. 35 ref.
(L17a; *Ni*)

86-L. (Italian.) **Montecatini "Bonders" for Phosphate Coating of Metals.** Federico Arborio Mella. *Pitture e Vernici,* v. 13, Sept. 1957, p. 600-602.

Theoretical principles of phosphate coating process. (L14b)

87-L.* Effect of Firing Schedules on Stress-Temperature Relations in Enamel-Metal Systems. J. H. Lauchner, R. L. Cook and A. I. Andrews. *American Ceramic Society, Journal,* v. 40, Dec. 1, 1957, p. 410-415.

Effect of box and continuous enameling furnace firing schedules on the thermal deflection of enameled iron strips was studied. Effective coefficient of thermal expansion values were calculated from coefficient of thermal deflection data. Results indicate that the effective thermal expansion values for annealed and unannealed enameled iron agree with the expansion data obtained by an interferometer study of the same enamels. Variation in the cooling rate of the enameling furnaces is sufficient to produce marked change in the development of thermal stress in the enameled iron. Residual compressive stresses in the enamel are increased by rapid cooling from firing temperatures. Tensile stress developed in the enamel during reheating is reduced by previous annealing.
(L27, Q25, P11g; CI)

88-L.* Descaling Bath for Titanium. *Automotive Industries,* v. 117, Dec. 1957, p. 130-132.

TEMCO Aircraft Corp. has developed and patented "Ti-Brite" process of scale removal that avoids damage to base metal. (L12; Ti)

89-L. Reconditioning Aircraft Parts With Molten Salt Bath. *Industrial*

Heating, v. 26, Nov. 1957, p. 2294-2296.

Versatile cleaning process developed by Kolene Corp. (L12n, T24)

90-L.* The HAE Process to Date. *Light Metal Age,* v. 15, Dec. 1957, p. 10-14.

Electrochemical process on Mg alloy produces a nonmetallic coating possessing excellent corrosion and abrasion resistance properties. (L17; Mg)

91-L. Examples of Results Obtained by Barrel Finishing. *Machinery,* v. 91, Oct. 11, 1957, p. 862-863.

Processing time and results with both ferrous and nonferrous components. (L10d)

92-L.* Technical Developments of 1957. Nathaniel Hall. *Metal Finishing,* v. 56, Jan. 1958, p. 40-49.

Comprehensive literature review. 354 ref. (L general, A9)

93-L.* Organic Finishing Developments of 1957. Daniel A. Marino. *Metal Finishing,* v. 56, Jan. 1958, p. 50-52.

Literature review. 70 ref. (L26, A9)

94-L.* Firm Adherent Plating for Aluminum. J. C. Withers and P. E. Ritt. *Metal Finishing,* v. 56, Jan. 1958, p. 53-54, 57.

A new method produces a thin coating of Ni on the surface of the Al. Heat treating forms a suitable base upon which any subsequent metal can be plated with perfect adhesion. (L17; Al)

95-L. Electroplating 22 Karat Gold-Silver Alloy. R. E. Harr and A. G. Cafferty. *Metal Finishing,* v. 56, Jan. 1958, p. 55-57.

(L17; Al, *Au, Ag*)

96-L.* An Introduction to Wash Primers. Pt. 1. *Metal Finishing,* v. 56, Jan. 1958, p. 58-60.

Analysis of various types of primers with special reference to WP-1. Plain steel test panels coated with wash primer revealed great corrosion resistance. (To be continued.) (L26; CN)

97-L. Some Aspects of Zinc, Copper, Nickel and Chromium Plating. L. Ades. *Metal Finishing Journal,* v. 3, Dec. 1957, p. 477-484, 496.

Deals with composition and operation. (L17; Zn, Cr, Cu, Ni)

98-L.* Direct Chloride Process for Tinning Cast Iron. C. J. Thwaites and J. J. Day. *Metallurgia,* v. 56, Dec. 1957, p. 263-270.

Newly developed process gives adequate adhesion to white metal bearing alloys, provided that fine grit is used for shot blasting and an ebullient flux layer covers the first tinning bath. Influence of the composition and structure of the cast iron, preliminary surface treatment and tinning and whitemetalling conditions. 7 ref. (L16; CI, *Sn,* SGA-c)

99-L.* Deposition of Metals Other Than Those of the Titanium Group by the Hot Filament Technique. R. A. J. Shelton. *Metallurgia,* v. 56, Dec. 1957, p. 283-289.

Deposition of V, Cb, Cr, W, Mo, Re, Fe, Os, Pt, Cu, Be and U. 27 ref. (L25)

100-L. Vacuum Coating at V.M.C. Ltd. *Product Finishing (London),* v. 10, Nov. 1957, p. 98-101.

(L23, 1-73; Al)

101-L. Cadmium Plating: How to Avoid Embrittlement. *Steel,* v. 141, Nov. 11, 1957, p. 132-134.

(L17a, Q26s; ST, *Cd*)

102-L.* Mechanized Surfacing With Alloy Materials. R. S. Zuchowski and J. H. Neely. *Welding Journal,* v. 37, Jan. 1958, p. 22-29.

Inert-gas tungsten-electrode hard surfacing with the addition of tungsten carbide powder; inert-gas consumable-electrode process with cold wire addition; and submerged-arc surfacing with any one of several techniques and with or without powder-alloy addition. (L24)

103-L. Metallurgical Surface Treatment of Tinplate Produced in Liskovec, Czechoslovakia. J. Teindl and A. Hrbek. *Hutnické Listy,* v. 12, no. 4, 1957, p. 329-332. (Henry Brutcher Translation no. 4042, Altadena, Calif.)

Previously abstracted from original. See item 300-L, 1957. (L14a, Sn, 8-62)

104-L. (Norwegian.) **Anodic Treatment. Norwegian Aluminum Co.** *Teknisk Ukeblad,* v. 104, Oct. 17, 1957, p. 4 of attachment.

Application of color to Al surfaces by anodic treatment. (L19; Al)

105-L. (Russian.) **Mechanization of Sandblast Lines.** P. N. Aksenov. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 15-18.

Brief review of 13 works recently published in the USSR and abroad dealing with theoretical and engineering aspects of sandblast machinery. (L10c, W2r)

106-L.* Aluminum Sheathing of Flat Uranium by Extrusion Cladding. A. J. Mooradian. *Atomic Energy of Canada Ltd.,* CRL-46. 27 p. 1957.

The Al sheathing of long flat U metal fuel elements by extrusion cladding has been developed to the point of trial production. The process consist of using the U flat as a moving mandrel over which the sheath is extruded directly, thereby completely encasing the U with Al as it passes through the die. Bonding of the sheath to the core may be achieved in the course of extrusion. The bond is stronger and more uniform in the case of a U plate which has been Ni-plated than in the case of bare uranium. However, in both cases, the sheath is found to be in good sonic contact with the core. Both Ni-plated and bare U flat elements sheathed in Al by the extrusion cladding method have been successfully tested under irradiation. There was no evidence of poor thermal transmission through the U-Al interface under the test condition of 47 watts per sq. cm. This method was developed for cladding flat plates used in making up reactor fuel rods. (L22, F24; U, Al)

107-L. Precision Barrel Finishing. Pt. 6. William E. Brandt. *Automatic Machining,* v. 19, Nov. 1957, p. 59-64.

Application of barrel finishing and tumbling to screw machine products; equipment, media and barreling procedure for descaling, deburring and finishing a variety of screw-machine parts. (L10d, 1-52)

108-L. Weld Hard Facing Materials. W. A. Martin. *Canadian Metalworking,* v. 20, Nov. 1957, p. 58-64.

Welding with hard-facing materials has become the recognized method of dealing economically with problems of metallic wear. (L24; CI, ST)

109-L. Variables Affecting Validity of Accelerated Coating Tests. *Corrosion,* v. 14, Jan. 1958, p. 124-130.

The principal cause of discrepancy is failure to take into account all variables in factors which affect coating performance. Factors are the environment, type of surface and its preparation, care and uniformity of application. (L general, 1-54)

110-L. Masking Film Put on by Dipping. William L. Timm. *Industrial Finishing,* v. 33, Oct. 1957, p. 62-68.

Conveyorized dip coating setup used to apply temporary over-all coating of masking material to metal parts which are to be chemically milled. (L26p, G24b)

111-L. U. S. Develops Ceramic-Type Coatings for Aluminum. John B. Franklin. *Industrial Finishing, (London),* v. 9, Oct. 1957, p. 862-863.

Process involves immersion of clean Al parts in chilled electrolyte and use of 15 to 20 v. at 12 to 15 amp. per sq. ft. between parts and metal tank. Oxide coatings formed are heavier than those obtained by conventional anodizing. (L19; Al)

112-L. Ceramic Coatings Raise Heat Resistance of Super-Alloys. P. A. Huppert. *Iron Age,* v. 180, Nov. 14, 1957, p. 157-159.

Ceramic coatings for protection of superalloys at elevated temperatures, physical properties of ceramic lithium compound and boron nitride. (L27; SGA-h, Li, B)

113-L. New Process Makes Nylon Coatings Possible. *Iron Age,* v. 180, Nov. 14, 1957, p. 160-161.

Process for applying nylon coatings to metal. (L26p)

114-L. Finer Finishes Mean Added Operations. *Metal Removing,* v. 2, Nov. 1957, p. 18-19.

Burnishing methods. (L10b)

115-L.* How to Barrel Finish Eggs. William Biebel. *Plating,* v. 45, Jan. 1958, p. 31-34.

Control of the six variables involved in size of media, speed of the barrel, mass height, water level, ratio of work to media and selection and use of compound, permit the barrel finishing of eggs and equally delicate parts. (L10d)

116-L.* Liquid Vs. Bar Buffing Compound. E. T. Candee. *Plating,* v. 45, Jan. 1958, p. 35-38.

Advantages of liquids over bars include: Liquids lend themselves to automatic and machine buffing because of infrequent operational interruption to replenish the supply of compound; danger in handling and replacing of bars of the machine in operation is eliminated; liquids lend themselves to many formulations which are not possible to produce in bar form. (L10a)

117-L.* Abrasive Wet Blasting for Cleaning and Finishing Metals. Alan R. Burman. *Plating,* v. 45, Jan. 1958, p. 45-48.

Process is performed with the utilization of a compressed air blasting gun to "throw" a mixture of water and abrasive. Water as the carrying medium allows the use of an extremely wide choice of abrasives; quartz, silica flour, novacite, aluminum oxide, silicon carbide, etc., ranging in particle size from 75 to 5000 mesh. (L10c)

118-L. Let's Cut Finishing Costs. Leland H. Vorce. *Plating,* v. 45, Jan. 1958, p. 50-51.

Current practice in large plating plants involves the most modern backstand equipment, newly improved contact wheels and recently developed resin-bonded abrasive belts as well as newer lubricants. (L10, W2n, W2p)

119-L. Hot-Dipped Aluminum Coatings. Herbert L. Kee. *Product Engineering,* v. 28, Oct. 28, 1957, p. 57-59.

Notes on base materials, both fer-

rous and nonferrous, to which hot dipped Al coatings can be applied. Corrosive conditions they resist and specific application of coated parts. (L16; Al)

120-L.* **Barrel Silver Plating.** I. J. Warwick. *Product Finishing,* v. 10, Oct. 1957, p. 61-65.

Chief application of silver plating by barreling. Main types of plating barrels, including semi-immersed, totally immersed and oblique models; electrical current requirement, recommended pretreatment and solutions for barrel plating. (L17, W3b; Ag)

121-L. **Phosphating Processes and Their Applications in Metal Finishing. Pt. 5. Process Control.** D. J. Fishlock. *Product Finishing,* v. 10, Oct. 1957, p. 84-93, 120.

Method of controlling phosphating processes including solution control and coating control. 18 ref. (L14b)

122-L. **Nickel Sulphamate Plating.** E. Calderon. *Product Finishing,* v. 10, Dec. 1957, p. 81-83. (L17a; Ni)

123-L. **Flame Spray Fights Wear and Corrosion.** Hoyt Todd. *Welding Engineer,* v. 42, Nov. 1957, p. 37-38.

Results obtained with flame spraying powdered nickel alloys through oxy-acetylene flame and fusing sprayed coatings. (L23; Ni)

124-L.* (Italian.) **Painting of Aluminum and Its Alloys.** *Alluminio,* v. 26, Nov. 1957, p. 489-500.

Techniques and materials; inspection methods. 9 ref. (L26; Al)

125-L. (Russian.) **Protective and Decorative Chromium-Plating of Aluminum Ware.** V. I. Lainer and Yu. A. Velichko. *Vestnik Machinostroeniya,* v. 37, Sept. 1957, p. 48-54. 6 ref. (L17; *Cr*, Al)

M Metallography

Constitution and Primary Structures

31-M.* **Evidence From Moiré Patterns of Packing Faults in Boron Nitride Crystals.** J. F. Goodman. *Nature,* v. 180, Aug. 31, 1957, p. 425-427.

Fringe formations observed by electron microscope. 4 ref. (M26r, M21e; B, N)

32-M. **Macroscopic Examination of Zircaloy-3A and Zircaloy-2 Primary Extrusion Billet Materials.** R. F. Lupi. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-RFL-8, May 3, 1957, 12 p. (CMA)

(M28k; Zr, 4-55, 4-60)

33-M. **Dilatometric Investigation of Zirconium, Zirconium-Uranium, Zirconium-Oxygen and Zirconium-Nitrogen Alloys.** R. K. McGeary. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-36, July 17, 1957, 26 p. (CMA) 7 ref. (M24b; Zr, U, N, O)

34-M. **Isothermal Sections in the Systems Molybdenum-Tungsten-Carbon and Molybdenum-Titanium-Carbon.** H. J. Albert. Massachusetts Institute of Technology, Technical Report No. 5, under Contract N5ori-07817. *U. S. Office of Technical Services,* PB 124159, June 1955, 13 p. (CMA)

(M24c; Mo, W, Ti, C)

35-M. (English.) **Spiral Patterns Observed on Surfaces of Aluminum Crystals.** Seiichi Karashima. *Institute of Scientific and Industrial Research, Osaka University, Memoirs,* v. 14, 1957, p. 80-90.

It is concluded that these spiral figures represent growth patterns of Al oxide deposited on specimen surface during polishing. 7 ref. (M26n;Al)

36-M.* (English.) **Subgrains in Cold Worked Aluminum.** H. Fumita and Zenji Nishiyama. *Institute of Scientific and Industrial Research, Osaka University, Memoirs,* v. 14, 1957, p. 91-105.

Mechanism of formation, size and shape of subgrains and characteristics of slip bands in heavily worked specimens of Al. 28 ref. (M27c, Q24a; Al)

37-M. (French.) **Nitrocellulose Replica of a Type of Anisotrope of Metallic Surfaces.** Pierre A. Jacquet and Georges Chaudron. *Comptes Rendus,* v. 245, Sept. 30, 1957, p. 1129-1132.

Behavior of polarized light on surfaces of anodic-oxidized Al and its alloys, and of anodic treated 18-8 steel. Important applications in the field of nondestructive metallography. 8 ref. (M21g; Al, ST, 8-73)

38-M. (German.) **Relation Between Normal Martensite and Non-Needle Martensite Textures in Fe-Mn-C Alloys.** A. Masin, V. Havel and J. Tlusta. *l'Academie Polonaise des Sciences, Bulletin,* v. 5, no. 3, 1957, p. 181-184.

(M27d, N8p; AY, *Mn*)

39-M. (German.) **Influence of Structure Upon the Machinability of Construction Steels.** W. Knorr. *Schweizer Archiv,* v. 23, Aug. 1957, p. 258-266. 11 ref. (M27, G17k; ST)

40-M.* **Observation of Dislocation Sites in Iron.** F. W. C. Boswell. *Metal Progress,* v. 72, Dec. 1957, p. 92-93.

Etch pits are useful in studying the arrangement and motions of dislocations in crystals. (M26b, M20; Fe)

41-M. (English.) **Orientation Studies of Cubic Crystal Plates by the Light-Figure Method.** Mikio Yamamoto and Jiro Watanabe. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Oct. 1957, p. 395-409.

Orientations of single crystal strips of pure iron and silicon iron can be determined with an accuracy well within ±0.5°. 8 ref. (M26c, M23c; Fe, Si, 14-61)

42-M. (English.) **Orientation Studies of Crystal Grains by Light Figures.** Mikio Yamamoto and Jiro Watanabe. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Oct. 1957, p. 410-418.

This technique, accurate within ±1°, can be applied to crystal grains with areas as small as 1 sq. mm. and can also be used to determine orientations of single crystals of any shape. 5 ref. (M26c, M23c; 14-61)

43-M. (Italian.) **On the Surface State of Zinc Monocrystals.** Bruna Rivolta. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 19, No. 1, 1957, p. 280-285.

Electron diffraction study of surface of Zn monocrystals on (00.1) and (11.0) planes after electrolytic polishing. Different methods of polishing; appearance of planes studied. (M20p; Zn, 14-61)

44-M. (Russian.) **Phase Analysis of Chromium-Nickel-Titanium Steel Containing Intermetallic Phase.** N. I. Blok, N. F. Lashko, K. P. Sorokina and F. F. Khimushin. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 901-903.

(M24d, M22g; ST. *Cr, Ni, Ti*)

45-M. (Russian.) **Phase Analysis of Ferro-Nickel-Titanium Alloys.** M. M. Shapiro and G. E. Levit-Gurevich. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 904-905.

(M24c; ST, *Ni, Ti*)

46-M. (Russian.) **Austenitometer With Alternating Magnetic Fields.** M. A. Kotkis. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 970-973.

Apparatus for measurement of any residual austenite in high-speed cutting tools. 6 ref. (M23a, 1-53, N8n; TS)

47-M.* **Phase Equilibrium Relationships at Liquidus Temperatures in the System FeO-Fe_2O_3-Al_2O_3-SiO_2.** Arnulf Muan. *American Ceramic Society, Journal,* v. 40, Dec. 1, 1957, p. 420-431.

The volume located between the 1 and 0.2 atm. O_2 isobaric surfaces of tetrahedron representing this system was studied in detail. Scattered data were obtained at lower O_2 pressures. Results obtained in the present investigation were combined with data in the literature to construct a phase equilibrium diagram at liquidus temperatures. 14 ref. (M24d; Fe, Al, Si, 14-68)

48-M. **Danger of Over-Development in Hypereutectic Aluminum-Silicon Alloys.** *Light Metals,* v. 20, Dec. 1957, p. 387-388. (From *Zeitschrift für Metallkunde,* v. 46, Aug. 1955, p. 574-578.)

Previously abstracted from original. See item 330-M, 1955. (M26, N12; Al, *Si*)

49-M. **Study of Bond Forces in Solid Solutions of Iron and Molybdenum From the Fine Structure of X-Ray Absorption Spectra.** V. A. Trapeznikov and S. A. Nemnonov. *Fizika Metallov i Metallovedenie,* v. 3, no. 2, 1956, p. 314-320. (Henry Brutcher Translation no. 4009, Altadena, Calif.)

Investigation of ratio of the amplitudes of the far and near fluctuations in the fine structure at the K absorption limit for Fe, Ni, Co and Fe-Mo (0 to 4% Mo) alloys at various temperatures. (M21f, M27b; Fe, Mo)

50-M. (Norwegian.) **Dislocations in Solids.** Alf Taraldsen. *Teknisk Ukeblad,* v. 104, Oct. 17, 1957, p. 847-853.

Proofs of existence of dislocations, their influence on the strength of metallic materials and on the methods of materials testing. 8 ref. (M26b, Q27a)

51-M. (Russian.) **Nature of the Carbide Phases of White Iron.** F. K. Tkachenko and V. F. Zubarev. *Liteinoe Proizvodstvo,* no. 11, Nov. 1957, p. 20-21.

Compares results obtained through use of magnetometer, X-rays and other methods. (M26r, M23; CI-p)

52-M.* **Some Effects of Heterogeneous Structures in Lead Pipes.** J. M. Butler. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 161-163.

Experiments indicate that lead pipes with hetergeneous (zoned) grain structures have a lower resistance to fatigue than either uniformly fine or uniformly coarse-grained pipes. A method is suggested for preventing the formation of heterogeneous structures by controlled deformation and recrystallization. The method might also be used to control grain-size independently of extrusion conditions. 6 ref. (M27c, N5; Pb, 4-60)

53-M.* **Plutonium-Iron System.** P. G. Mardon, H. R. Haines, J. H.

Pearce and M. B. Waldron. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 166-171.

Equilibrium diagram for Pu-Fe alloys. Results verify existence of the compounds Pu_6Fe and $PuFe_2$; low-melting-point eutectic between delta-Pu and Pu_6Fe; and a high-melting-point eutectic between $PuFe_2$ and gamma-Fe. 11 ref.
(M24b; Pu, Fe)

54-M.* Preliminary Investigation of the Plutonium-Thorium System. D. M. Poole, G. K. Williamson and J. A. C. Marples. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 172-176.

X-ray, metallographic, thermal-analysis and dilatometric studies used to investigate the Pu-Th phase diagram. Plutonium dissolves extensively in alpha-Th, the maximum solubility being 48.5 at. % at 615° C. The large solubility of Pu in alpha-Th is possibly associated with a considerable increase in the apparent atomic radius of the Pu atom; this large radius corresponds to a valency of 4 on Zachariasen's scheme, equal to that of Th; this, it is suggested, accounts for the wide stability range of the solution. 4 ref.
(M24b; Pu, Th)

55-M.* Aluminium-Rich Intermetallic-Compound Phases in the System Aluminium-Iron-Cobalt-Copper. G. V. Raynor and B. J. Ward. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 182-184.

Metallographic and X-ray methods, together with the chemical analysis of primary crystals extracted from slowly cooled alloys, show that the phases T(CoCu) and T(FeCu) form a complete series of solid solutions in the quaternary system Al-Fe-Co-Cu.
(M24d; Al, Fe, Co, Cu)

56-M.* Lattice Spacings and Melting Points in the Thorium-Cerium System. R. T. Weiner, W. E. Freeth and G. V. Raynor. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 185-188.

The Th-Ce system studied by X-ray and micrographic methods. The system shows complete solid solution over the whole composition range at room temperature. The alloys are face-centered cubic, and an anomalous decrease in the lattice spacing of the Th-rich alloys with increasing Ce content is observed. It is suggested that this anomaly is caused by the transition of an electron normally in a 4f ionic state in Ce to a 5d bonding state. 13 ref.
(M26, P12n; Th, Ce)

57-M.* Constitution of Magnesium-Rich Magnesium - Aluminium - Calcium Alloys. J. A. Catterall and R. J. Pleasance. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 189-192.

Isothermal sections at 450, 370 and 290° C. of the Mg-Al-Ca system have been constructed at compositions up to 6 wt. % Al and 1.6 wt. % Ca. The phases appearing in this range are alpha (Mg), Mg_2Ca, Al_2Ca, and $Mg_{17}Al_{12}$. (M24c; Mg, Al, Ca)

58-M. (Russian.) **About Surplus Vacancies Appearing in Brass Upon Evaporation of Zinc.** Ya. E. Geguzin and N. N. Ovcharenko. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 400-406.

7 ref. (M26s; Cu, Zn)

59-M.* (Russian.) **Study of Dependence of Bond Forces on State of Crystals in Metals and Solid Solutions.** V. A. Ilina, V. K. Kirtskaya, G. V. Kurdyumov, Yu. A. Osipyan and T. I. Stelletskaya. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 417-431.

Investigation of heat treatment and plastic deformation upon bond forces in crystals of solid solutions: Fe-Cr, Fe-W, Fe-Mn, Fe-Ti and in metals: Cr, Ta and W. Change of the value of bond forces in crystals is the result of regrouping of the atoms in the crystal lattice on heat treatment and plastic deformation. 24 ref.
(M25, M26, 2-64, 3-68)

60-M. (Russian.) **Influence of Crystalline Lattice Static Flaws Upon Mechanical Properties of Alloys.** V. A. Pavlov. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 432-438.

Mechanical properties of Fe-C and Al-Mg alloys in respect to deformation of crystalline lattice of the main component. 29 ref.
(M26, Q general; Fe, Al, Mg)

61-M. (Russian.) **Influence of Induction Heating Parameters Upon Grain Size of Austenite in Nickel Steel.** I. N. Kidin. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 36-42.

(M27c, 2-64; AY, *Ni*)

62-M. (Russian.) **Development of High-Temperature Metallography.** M. G. Lozinski. *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1957, p. 18-42.

Methods and instruments in study of microstructure of heated metals and study of properties of metals at different temperatures. 23 ref.
(M27, 2-62, P general, Q general)

N Transformations and Resulting Structures

54-N.* Structural Change and Recrystallization of Hydrogen-Hardened Palladium. Takesi Sugeno and Hideaki Kawabe. *Institute of Scientific and Industrial Research, Osaka University Memoirs,* v. 14, 1957, p. 25-35.

When Pd adsorbs hydrogen electrolytically, two face-centered-cubic phases, alpha and beta, are formed depending upon the concentration of hydrogen. The hardness of Pd increases with hydrogen concentrations in alpha phase and is constant in the beta phase. When hydrogen is discharged either thermally or anodically, the alpha phase Pd resumes the hardness of the annealed state, whereas beta phase Pd is still in the hardened status. Microscopically, beta phase Pd has many parallel line markings, and crystallographically, these line markings are in good agreement with intersections of (111) planes and the surface plane. The hydrogen-hardened beta phase Pd recrystallizes by annealing at about 600° C. This recrystallization is not caused by ordinary nucleations and growth mechanism, which is generally found in annealing of the cold worked metals. 5 ref. (N5; Pd, *H*)

55-N.* Interstitial Diffusion of Copper in PbS Single Crystals. J. Bloem and F. A. Kröger. *Philips Research Reports,* v. 12, Aug. 1957, p. 281-302.

At temperatures $100 < T < 500°$ C., Cu can diffuse rapidly into PbS via interstitial sites. Existing cation vacancies are filled by Cu, while Cu may also be bound by S at internal surfaces (cracks, dislocations). In the presence of S in the atmospheres (H_2S), Cu does not enter the crystal; interstitial Cu already present in the crystal may be drawn out when the crystal is heated in such an atmosphere. The effect is attributed to a lowering of the thermodynamic potential of Cu by the formation of Cu_2S or CuS. 18 ref.
(N1; Cu, Pb, 14-61)

56-N.* Interstitial Diffusion of Nickel in PbS Single Crystals. J. Bloem and F. A. Kröger. *Philips Research Reports,* v. 12, Aug. 1957, p. 303-308.

Under reducing conditions, Ni may penetrate into PbS crystals at temperatures $T < 500°$ C. at which the self-diffusion in PbS is negligible; it diminishes p-type conductivity and may cause n-type conductivity with donors of a depth $E \approx 0.03$ ev. The diffusion probably takes place via the interlattice with a diffusion constant $D_{Ni} = 17.8 \exp(-22000/RT)$ cm^2 sec^{-1}. Under sulphurizing conditions (H_2S) the Ni can be drawn out of the crystal again and the original conductivity restored.
(N1; Ni, Pb, 14-61)

57-N. (French.) **Dehomogenization of Carbon in a Solid Austenite Solution.** Louis Colombier, Joseph Hochman and Jean Bourrat. *Comptes Rendus,* v. 245, Sept. 30, 1957, p. 1135-1138.

Radioactive carbon study. 9 ref.
(N8, M23q; ST)

58-N. (German.) **Diffusion of Antimony in Silver.** W. Weller. *Annalen de Physik,* v. 20, no. 1-6, 1957, p. 42-44.

Diffusion proceeds in direction of Sb to Ag. 5 ref. (N1; Sb, Ag)

59-N. (German.) **Measurement of Nitrogen Escape for Pure Molten Iron in a Vacuum.** R. Jaeckel and H. Junge. *Annalen der Physik,* v. 20, no. 1-6, 1957, p. 331-336.

(N16m, 1-73; Fe-a, N)

60-N. (German.) **Formation of Martensite Lines in a Fe-Mn-C Alloy.** A. Masin. *Bulletin de l'Academie Polonaise des Sciences,* v. 5, no. 3, 1957, p. 185-190.

(N8p; Fe, *Mn, C*)

61-N. Diffusion of Mercury in Amorphous Selenium. S. Steeb and K. H. Jürgensen. *Zeitschrift für Elektrochemie,* v. 61, June 1957, p. 763-767.

(N1; *Hg*, Se)

62-N.* Tool Steels in Service. Pt. 1. Theorectical Considerations. A. P. T. Taylor-Gill. *Iron and Steel,* v. 30, Dec. 1957, p. 631-635.

Comparison of T-T-T curves for four classes of steel; structures for service conditions; hardness range; maximum wear resistance. (To be continued.) (N8g; TS)

63-N.* Production of Ferrite in Spheroidal Graphite Cast Iron by Heat Treatment. John Gittus. *Iron and Steel,* v. 30, Dec. 1957, p. 639-641.

Ferrite is produced by the graphitization of the carbide constituent of the pearlite, a process which is retarded by the presence of minor amounts of Sn and Cu, Bi, Pb, Cr, Mn and In. (N8s, 2-60; CI-r)

64-N.* Mechanism of Formation of Banded Structures. Paul G. Bastien. *Iron and Steel Institute, Journal,* v. 187, Dec. 1957, p. 281-291.

The banded structure in steel is produced by chemical heterogeneity due to dendritic or small-scale segregation during the cooling of the ingot. Each element which in solid solution produces a displacement of the temperature of the upper transformation point A_3 of the steel, accompanied in some cases by a horizontal displacement of the transformation curve can give rise to a banded structure. 42 ref.
(N12; ST, 5-59)

65-N.* **Low-Carbon Bainitic Steels.** K. J. Irvine and F. B. Pickering. *Iron and Steel Institute, Journal,* v. 187, Dec. 1957, p. 292-309.

The main feature of these steels is that the normal polygonal ferrite formation is retarded so that transformation to bainitic ferrite can occur over a wide range of cooling rates. This is achieved most effectively with a ½% Mo-B base composition. The tensile strength of the steel depends to a large extent on the temperature of transformation, which is controlled by an additional alloy element. With additions of alloying elements up to about 3% it is possible to reduce the transformation temperature from 650 to 450° C. and at the same time to increase the tensile strength from 40 to 80 tons per sq. in. 15 ref. (N8m, 2-60; AY)

66-N.* **Tempering of Low-Alloy Creep-Resistant Steels Containing Chromium, Molybdenum and Vanadium.** E. Smith and J. Nutting. *Iron and Steel Institute, Journal,* v. 187, Dec. 1957, p. 314-329.

Hardness changes which occur during the tempering of a range of quenched 0.2% C steels containing up to 3% Cr, 1% V and 1% Mo have been measured. The accompanying microstructural changes were determined by preparing extraction replicas for the electron microscope; the precipitated carbides were identified by transmission electron diffraction and selected-area electron diffraction. 27 ref. (N8a, Q29n, M21e; AY, *Cr, Mo, V*)

67-N.* **Recrystallized Surfaces of Aluminum Extrusions.** Guy V. Bennett. *Metal Progress,* v. 72, Dec. 1957, p. 102-104.

"Cold" work at surfaces of extruded bar may nucleate recrystallization of deep surface layers, producing a layer of metal of low strength and endurance. (N5, Q general; Al, 4-58)

68-N. (Czech.) **Influence of Silicon and Chromium on Eutectoid Isothermal Transformation of Austenite in Spheroidal Cast Iron.** Stanislav Drapal. *Hutnické Listy,* v. 12, Oct. 1957, p. 899-907.

11 ref. (N8, 2-60; CI-r, *Si, Cr*)

69-N. (Russian.) **Two Mechanisms of Micro-Heterogenization of Crystals in Solid Solutions of Two-Phase Alloys.** V. M. Glazov and G. A. Korolkov. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 18-23.

The two mechanisms are evident in the phase diagram at the saturation point at the eutectic temperature. 6 ref. (N12p, M24)

70-N. (Russian.) **Method of Carbide Formation During Annealing of Carbon Steel.** B. A. Apaev. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 23-24.

The dependence of carbide development on the carbon content of steel is conditional on the formation of martensite. Possibly it is connected with the distribution of carbon which is formed in the gamma solution during the cooling process. (N8r, J23; CN)

71-N. (Russian.) **Structural Changes in Cemented Carbides on Heating.** P. K. Mikhailova. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 45-48. (Also *Henry Brutcher Translation* no. 4045, Altadena, Calif.)

Size of tungsten carbide grains changed while being heated to 800-1000° C. (N3, 2-62, 6-19; W, Co)

72-N. **Prevention of Segregation in the Solidification of Steel by Treatment With Rare-Earth Elements.** V. M. Tageev and Yu. D. Smirnov. *Stal',* v. 17, no. 9, 1957, p. 823-828. (Henry Brutcher Translation no. 4060, Altadena, Calif.)

Previously abstracted from original. See item 390-N, 1957. (N12, 2-60; ST, AD-p, EG-g)

73-N. **Effect of Prior Partial Transformation of Austenite on Subsequent Isothermal Transformation at Lower Temperatures.** H. J. Hucek. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121189, Sept. 1955, 35 p. $1.

(N8g; ST)

74-N.* **Continuous Cooling Transformation Characteristics of Three Types of Weld Metal.** E. F. Nippes and E. C. Nelson. *Welding Journal,* v. 37, Jan. 1958, p. 30s-36s.

Transformation diagrams for Types 180, 230 and 260 weld metals. Differences in transformational behavior and microstructure discussed in terms of alloy content. 4 ref. (N8; ST, 7-51)

75-N.* **Certain Aspects of the Recrystallization of Lead and Dilute Lead Alloys.** J. M. Butler. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 155-161.

Conditions under which commercial leads similar to those used for water pipes may recrystallize in manufacture or service to give undesirable heterogeneous structures. Effects of extrusion temperature, of water quenching and of the composition of Pb have been determined; methods of avoiding deleterious structures are indicated. The recrystallization behavior of Pb containing small alloying additions has been examined to determine which material is least susceptible to the formation of heterogeneous structures. 14 ref. (N5, 2-60, 2-61, 2-64; Pb)

76-N.* (Italian.) **On the Solubility of Aluminum and Silver in Silicon.** V. Gottardi. *Metallurgia Italiana,* v. 49, Oct. 1957, p. 721-724.

Solubility was determined by spectrographic analysis of hypereutectic crystals of Si separated from binary alloys after growth induced by heat treatment. Temperature-eutectic composition curves obtained for Ag-S; system differed somewhat from those proposed by other authors. 11 ref. (N12; Al, Ag, Si)

77-N.* (Russian.) **Carbide Transformations on Tempering of Steel.** V. G. Permyakov and M. V. Belous. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 490-499.

Investigation of carbide transformation of carbon and silicon steels on tempering using magnetic, differentional method. Low-temperature tempering Curie point was found to be 380° C. Relationship between steel magnetization change on tempering and composition of low-temperature carbide. Composition of the carbide of Si steel was approximately Fe_2C. Specific magnetization of the carbide was 100-110 gauss per cu. cm. per g. 21 ref. (N8a; ST)

78-N. (Russian.) **Investigation of Carbide Phases of Tempered Carbon Steel.** N. V. Gubkova, E. I. Levina and V. A. Tolomasov. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 500-504.

12 ref. (N8a; CN)

79-N. (Russian.) **Mechanism of Zinc Monocrystal Formation Applying Zone Melting Method.** V. N. Rozhanski, N. V. Dekartova and I. A. Bakeeva. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 527-530.

4 ref. (N12, C28k, 14-61; Zn)

80-N. (Russian.) **Microstructure Study of Overcooled Austenite Decomposition in Magnesium-Treated Cast Iron Containing Spheroidal Graphite.** D. Sh. Frolov and A. N. Mirza. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 4-9.

3 ref. (N8s, M27, 2-63; CI-r, Mg)

81-N. (Russian.) **Pearlitic Transformation in Chromium Steel Containing Columbium and Zirconium.** D. Ya. Vishnyakov and L. S. Olkhovoi. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 18-21.

(N8h; SS, *Cb, Zr*)

82-N. (Russian.) **Determination of Amount of Martensite Formed in Presence of Two Ferromagnetic Phases in the Alloy.** F. A. Bogachev. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 921-924.

Examination of Fe-Ni and Fe-Ni-Co alloys. 6 ref. (N8p, M23; Co, Fe, Ni)

Physical Properties

35-P.* **Thermodynamics of the Ta-O System: The Dissociation Energies of TaO and TaO_2.** Mark G. Inghram, William A. Chupka and Joseph Berkowitz. *Journal of Chemical Physics,* v. 27, Aug. 1957, p. 569-571.

Mass spectrometric analysis of the vapor in thermodynamic equilibrium with mixtures of Ta (s) and Ta_2O_5 (s) has shown TaO and TaO_2 to be the predominant gaseous molecules present. The experimental data yield 8.4 ± 0.5 ev. and 15.0 ± 0.5 ev. for the energies of atomization of these molecules at 0° K. 18 ref. (P12; Ta, *O*)

36-P. **Is Cobalt Harmful in Stainless Steel?** Joseph R. Lane. *Metal Progress,* v. 72, Dec. 1957, p. 86-87.

In certain nuclear applications where neutron absorption converts the element into Co-60, stainless steels containing Co could become dangerous radiation sources. (P18h, 2-60; SS, Co, 2-67)

37-P* **An Investigation Into the Effect of Magnetic Domains in Cobalt on an Electron Beam.** M. Blackman and E. Grunbaum. *Royal Society Proceedings, Series A, Mathematical and Physical Sciences,* v. 241, Sept. 10, 1957, p. 508-521.

The effect on an electron beam of the leakage field due to the magnetic domains in an unmagnetized crystal of hexagonal Co has been investigated. A conventional electron-diffraction camera was used, the primary beam being limited by a small movable aperture and the deflexions observed on a photographic plate. Both the hexagonal and prism faces were examined. Magnetic effects were found (a) on the primary beam, (b) on the diffraction pattern, (c) on the shadow edge of the diffraction pattern, and (d) on the shadow photograph of the crystal produced by diffuse scattering from the edge of the aperture. These effects are analyzed in terms of the fields produced by the magnetic do-

mains; measurements are made of the size of the domains and of the magnitude of the leakage field at the surface and its variation with the distance from the surface. 10 ref. (P16c; Co)

38-P. Effect of Radiation on the Thermal Conductivity of Uranium—1.6% Zirconium. H. W. Deem, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-986, Mar. 16, 1955, 15 p. (CMA)

(P11b, 2-67; U, Zr)

39-P. Electrochemistry of Zirconium. R. E. Meyer. Oak Ridge National Laboratory. *U. S. Atomic Energy Commission,* ORNL-2386, Oct. 28, 1957, p. 114-116. (CMA)

The open-circuit potential time and the d-c. polarizabilities were measured in H_2SO_4. The exact behavior was dependent on surface treatment, temperature and composition of the solution. Zr forms oxide layers when anodized. Generalities are offered on the model of a Zr electrode. (P15; Zr)

40-P. Porosity in Formed Titanium. R. A. Wood, et al. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 72. *U. S. Office of Technical Services,* PB 121628, May 1957, 42 p. (CMA)

Surface pitting and internal voids are formed in areas of Ti parts which have been highly strained. This kind of porosity may be affected by the deformation temperature, amount of strain, the strain rate, state of stress, and amount and kind of impurity. (P10m; Ti)

41-P. Physical Properties of Titanium and Titanium Alloys. W. J. Lepkowski and J. W. Holladay. Battelle Memorial Institute, Titanium Metallurgical Laboratory, Report 39. *U. S. Office of Technical Services,* PB 121629, July 1957, 87 p. (CMA)

(P general; Ti)

42-P. (German.) **Effect of Dislocation on Ferromagnetism of Nickel.** Martin Kersten. *Annalen der Physik,* v. 20, no. 1-6, 1957, p. 337-338.

(P16; Ni)

43-P. (German.) **Magnetic Susceptibility of Liquid Selenium and Tellurium.** G. Busch and O. Vogt. *Helvetica Physica Acta,* v. 30, Aug. 1957, p. 224-227.

(P16; Se, Te)

44-P. (German.) **Anisotropy of Thermal Expansion in Iron-Nickel Alloys. Pt. 1.** Gerhard Papke. *Zeitschrift für Physikalische Chemie,* v. 207, June 1957, p. 91-110.

Expansion on rolling of Fe-Ni sheets. 15 ref. (P11g, F23; Fe, Ni)

45-P.* (Italian.) **Study of the Electrochemical Behavior of Metal Monocrystals. Pt. 2.** Roberto Piontelli, Guido Poli and Lucia Paganini. *Istituto Lombardo de Scienze e Lettere, Rendiconti,* v. 91, no. 11, 1957, p. 355-370.

Anodic and cathodic over-voltages of Cu and Ag single crystal electrodes; active surface oriented following (111) and (100) investigated at 25° C. with different solutions and current densities. The structural changes involved studied by electron diffraction, and by micrography. 9 ref. (P15)

46-P.* (Italian.) **Study of the Electrochemical Behavior of Metal Monocrystals. Pt. 3.** Roberto Piontelli, Ugo Bertocci and Claudio Tamplenizza. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. 11, 1957, p. 378-385.

Hydrogen over-voltages, in H_2SO_4 0.1 *N,* at 25, 40 and 55° C., on electrodes of Cu single crystals, in the shape of disks, whose active surface was oriented following (111), (110), (100), and on Cu polycrystalline electrodes. Tafel law holds true. The parameters are coincident for all of the investigated electrodes. 10 ref. (P15; Cu)

47-P.* (Italian.) **Study of Electrochemical Behavior of Thallium.** Ugo Bertocci and Sergio Ticozzi. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. 11, 1957, p. 386-396.

Measurements of the anodic and cathodic overvoltage of Tl at 25 and 40° C. in various solutions. Results coincided with those previously reported as "normal" behavior for Tl, even in hydrate solutions which had not previously been studied. 5 ref. (P15; Tl)

48-P. (English.) **Activity of Manganese and Carbon in Iron-Carbon-Manganese Melts.** Masayasu Ohtani. *Tohoku University, Science Reports of the Research Institutes,* v. 9, Oct. 1957, p. 426-433.

Activities were determined by measuring the e.m.f. corresponding to the change in Mn and C content at 1540° C. in an electrode concentration cell. 10 ref. (P12b, 2-60; Fe, *C, Mn*)

49-P. (Italian.) **Research on the Electrochemical Behavior of Polycrystalline Zinc.** Ugo Bertocci. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. 1, 1957, p. 40-54.

Measurements were taken of anodic and cathodic overvoltage of Zn in zinc chloride, sulphate and perchlorate solutions, and influence of acidity, temperature and current density was studied. Overvoltage increases in the following order of solutions: chloride, sulphate, perchlorate. Voltage-current curves are almost symmetrical in relation to equilibrium value of zinc electrode. 19 ref. (P15; Zn)

50-P. (Italian.) **Research on the Electrochemical Behavior of Silver.** Guido Poli. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. 1, 1957, p. 258-270.

Via oscillographic recording of voltage-time curves for very brief rectangular current impulses, anodic and cathodic behavior of Ag in perchlorate, nitrate and sulphamate solutions is studied. Influence of anion and of Ag salt and acid concentrations in solutions on maximum polarizations and initial polarization capacities. Activating effect of sulphamic and nitric anions and of hydrogen ions was confirmed. Overvoltage of Ag is interpreted as due to process of crystallization. 15 ref. (P15; Ag)

51-P. (Russian.) **Conditions of Deformation Influencing the Physical Properties of Alloy VD17.** M. Ya. Kuleshov, N. P. Petrov and V. I. Vlasov. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 33-39.

Samples of a heat resisting alloy widely used for vanes in aviation motor compressors were deformed in a 700-ton press under differing conditions. The physical characteristics remained within the technical requirements; however, elongation per unit length was almost two times greater than specified. (P general, P10d, Q24; SGA-h)

52-P. (Russian.) **Perfection of Simultaneous Determination of Heat Transfer and Conductivity of Steel.** R. E. Krzhyzhanovskii. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 925-927.

(P11h, P11k; ST)

53-P. (Russian.) **Simplified Determination of Steel Heat Transfer Coefficient.** L. A. Brovkin. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 929-931.

(P11k; ST)

54-P. (Russian.) **Investigation of Interphase Tension.** S. I. Rempel and L. V. Yureva. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 934-936.

Method of interface tension measurement between liquid phase of light metals and slag. (P13h; RM-q, EG-a39)

55-P.* **Predicting the Thermodynamic Stabilities and Oxidation Resistances of Silicide Cermets.** Alan W. Searcy. *American Ceramic Society, Journal,* v. 40, Dec. 1, 1957, p. 431-435.

Available information is used to demonstrate the calculation of the stability of silicide-metal mixtures. The cause of the outstanding oxidation resistance of certain silicides is analyzed, and the results are used to predict high oxidation resistance for several untested disilicides. Thermodynamic and structural arguments are applied to the prediction of compositions of thermodynamically stable and oxidation resistant cermets. 14 ref. (P12; 6-70)

56-P.* **Elastic Properties and Specific Heats of Solids.** Carl W. Garland. *Chemical Education,* v. 34, Dec. 1957, p. 597-600.

Theory of lattice heat of crystalline solids; method of calculating heat capacity at constant volume from knowledge of frequency spectrum of normal modes of lattice vibrations; role played by elastic properties of solids in determining this frequency spectrum. All with reference to ideal macrocrystalline case. 21 ref. (P12r, Q21)

57-P. Testing and Examination of Electrodeposits. Pt. 5. Porosity Tests. R. Quarendon. *Product Finishing (London),* v. 10, Nov. 1957, p. 70-82, 132.

56 ref. (P10m, 1-54; 8-62)

58-P. Dynamic Magnetostrictive Properties of Alfenol. C. M. Davis, Jr., and S. F. Ferebee. U. S. Naval Ordnance Laboratory. *U. S. Office of Technical Services,* PB 131168, Oct. 1955, 33 p. $1.

(P16b, T1g; Al, Fe)

59-P. Effects of Temperature on Magnetic Properties of Core Materials. M. Pasnak. U. S. Naval Ordnance Laboratory. *U. S. Office of Technical Services,* PB 131130, May 1956, 36 p. $1.

(P16, T1g, 2-63)

60-P. Effect of Nuclear Irradiation on Magnetic Properties of Core Materials. R. S. Sery, R. E. Fischell and D. I. Gordon. U. S. Naval Ordnance Laboratory. *U. S. Office of Technical Services,* PB 131014, Dec. 1956, 45 p. $1.25.

(P16, T1g, 2-67)

61-P. Apparatus for Measuring Surface Tension and Density of Liquid Metals in Vacuum. N. L. Pokrovskii and M. Saidov. *Fizika Metallov i Metallovedenie,* v. 2, no. 3, 1956, p. 546-551. (Henry Brutcher Translation no. 4011, Altadena, Calif.)

Previously abstracted from original. See item 447-P, 1956. (P10a, P13h; Sn)

62-P.* (Spanish.) **Influence of the Gaseous Phase on Cation Exchange in the Silver-Cupric Sulphate System.** F. Barreira and Maria del Carmen Brinquis. *Real Sociedad Espanola de*

Fisica y Quimica, Anales, Serie B, Quimica, v. 411-B, Sept-Oct. 1957, p. 663-666.

Similar results were obtained for metallic Ag in 5*N* solution of cupric sulphate, both in presence of air and of argon. Conclusion is that, for case studied, presence of oxygen is not necessary to achievement of ion exchange between metal and electrolyte. 12 ref. (P15; Ag)

63-P.* Viscosity of Lead, Tin and Their Alloys. W. R. D. Jones and J. B. Davies. *Institute of Metals, Journal,* v. 86, Dec. 1957, p. 164-166.

Viscosity varies in accordance with the equilibrium diagram, a marked change being found at the limit of solid solubility and a minimum at the eutectic. Small additions of Sn increase appreciably the viscosity of Pb. 9 ref. (P10f, 2-60; Pb, Sn)

64-P. Nickel Alloys for Controlled Thermal Expansion. E. M. Wise. *Product Engineering,* v. 28, Oct. 28, 1957, p. 68-71.

Composition of some common Ni alloys and data on thermal expansion coefficient. (P11g; Ni)

65-P.* (Italian.) **Influence of Various Elements on the Resonance of Aluminum.** T. Federighi. *Alluminio,* v. 26, Oct. 1957, p. 422-425.

Greatest increases were caused by Cu and Mg, intermediate by Si and Mn, least by Zn and Ag. (P18m, 2-60; Al, *Cu, Mg, Si, Mn, Zn, Ag*)

66-P.* (Italian.) **Thermodynamics of Liquid Metallic Systems Having Two Components.** L. Riccoboni, L. Oleari and M. Fiorani. *Metallurgia Italiana,* v. 49, Oct. 1957, p. 725-744.

Experimental methods of deteming activity of components of a liquid metallic system; special attention to method based on chemical equilibria; contribution of thermodynamic research to understanding of metallic systems. 108 ref. (P12b, M24b)

67-P. (Russian.) **Certain Peculiarities of Electrical Resistance of Nickel-Chromium Alloys.** S. D. Gertsriken and A. V. Progrushchenko. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 505-510.

4 ref. (P15g; Cr, Ni)

68-P. (Russian.) **Thermal Deformation of Machine Tools.** Y. N. Sokolov. *Stanki i Instrument,* v. 28, Oct. 1957, p. 12-15.

(P11g, T6n)

Q Mechanical Properties and Tests

93-Q. Abnormal Decay Patterns for Ultrasonic Waves in Metal Rods. John Awatani and Hiroshi Miyamoto. *Institute of Scientific and Industrial Research, Osaka University Memoirs,* v. 14, 1957, p. 47-52.

Anomaly in decay patterns observed in attenuation measurements is investigated for longitudinal ultrasonic waves in cylindrical rods. Anomaly appears to be due to (1) interference among several modes excited in the rod by a quartz crystal transducer, and (2) residual stresses or fiber structure resulting from production processes. For some materials an appropriate annealing operation can eliminate the second cause. A formula is derived for determining whether or not abnormal decay is due between observed modes. 4 ref. (Q22f; Al, Si)

94-Q. Some Properties of Zirconium-Niobium Alloys. Yu. F. Bychkov, A. N. Rozanov and D. M. Skorov. *Journal of Nuclear Energy,* v. 5, no. 3/4, Pt. II. (Translated by Pergamon Press); also *Soviet Journal of Atomic Energy,* v. 2, no. 2, 1957, p. 402-407. (Translated by Consultants Bureau, Inc.) (CMA)

Previously abstracted from original. See item 513-Q, 1957. (Q27a, Q29n, 2-62, M24a; Zr, Cb)

95-Q. Young's Modulus of Zirconium-Niobium Alloys. Yu. F. Bychkov, A. N. Rozanov and D. M. Skorov. *Journal of Nuclear Energy,* v. 5, no. 3/4, Pt. II. (Translated by Pergamon Press); also *Soviet Journal of Atomic Energy,* v. 2, no. 2, 1957, p. 408-412. (Translated by Consultants Bureau, Inc.) (CMA)

Previously abstracted from original. See item 514-Q, 1957. (Q21a, 1-54, 2-64; Zr, Cb)

96-Q.* Improved Formability of Galvanized Sheet. J. R. Kattus. *Metal Progress,* v. 72, Dec. 1957, p. 82-85, 140.

High-speed tensile tests, on both smooth and notched specimens, show significant differences between the properties of galvanized sheet that are acceptable and those that are susceptible to breakage in fabrication on a Lockformer machine. The notched ultimate strength provides the best measure of performance, increasing strength being indicative of increasing susceptibility to breakage. (Q23q, Q27a, 3-67; ST, Zn, 4-53)

97-Q. Strain Sensitivity of Some Mechanical Properties and Failure Characteristics of Zircaloy-2 Tubing. L. F. Cochrun. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission,* WAPD-FE-1005, Sept. 14, 1955, 9 p. (CMA)

Results evaluated for the bursting pressure, precent circumferential strain at bursting, area of crack opening and hole size of fracture. (Q27a, 3-68; Zr, 4-60)

98-Q. Weight - Shape Conversion Tables for Zircaloy-2. J. G. Goodwin. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission.* WAPD-TM-86, May 10, 1956, 11 p. (CMA)

(Q general; Zr)

99-Q. Tensile Properties and Metallographic Study of Zircaloy-3 Strip. R. L. Mehan. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-RLM-12, June 13, 1957, 55 p. (CMA)

(Q27, M27; Zr)

100-Q. Evaluation of the Engineering Properties of Titanium Carbide Base Cermets. J. C. Redmond, et al. Wright Air Development Center. Technical Report 57-25. *U. S. Office of Technical Services,* PB 131026, July 1956, 67 p. (CMA)

TiC-base cermets were evaluated in impact tests, fatigue tests and by testing tensile stress-strain to rupture. (Q general; Ti, C, *Ni, Cr, W,* 6-70)

101-Q.* Discussion of Some Models of the Rate-Determining Process in Creep. N. F. Mott. Paper from "Creep and Fracture of Metals at High Temperatures", p. 21-24.

Attempts to account for some of the facts of creep in terms of the movement of dislocations. Maintains that there are great difficulties in accepting the hypothesis of "climb" of dislocations, and that cell formation (polygonization) may occur through slip alone. In this case the rate-determining process must be slip and it is suggested that the barriers of greatest importance are jogs in screw dislocations. A stress-dependent activation energy for creep, which approaches that for self-diffusion at low stresses, results from this model. 14 ref. (Q3n, Q24a)

102-Q. Plastic Deformation of Aluminium Single Crystals at Elevated Temperatures. R. D. Johnson, A. P. Young and A. D. Schwope. Paper from "Creep and Fracture of Metals at High Temperatures", p. 25-46.

Creep tests were performed at elevated temperatures while maintaining a constant resolved shear stress to study the nature of the creep curve in crystals oriented for single slip on a (111) plane. Constant-load creep tests were employed to determine empirically the amount by which a high-temperature slip system, containing either a (100) plane or a plane tentatively identified as either a (311) or a (211) plane, had to be favored in order to operate. 43 ref. (Q3, Q24a, 2-62; Al, 14-61)

103-Q.* Mechanism of Grain Boundary Displacement and Its Relation to the Creep Process as a Whole. F. N. Rhines. Paper from "Creep and Fracture of Metals at High Temperatures", p. 47-57.

Study of the tensile creep behavior of pure Al bicrystals, having flat grain boundaries at 45° to their axes of loading. These specimens each had photo-engraved, upon one face, a reference pattern (of 133 squares to the in.) that facilitated the measurement of both the grain boundary displacement and the concurrent extension of the grains themselves. About 100 such bicrystals were tested within a temperature range of 200 to 650° C. and a stress range of 10 to 1600 psi., the duration of single tests attaining an exceptional maximum of one year. 8 ref. (Q3, N3; Al)

104-Q.* Creep Processes. W. A. Wood. Paper from "Creep and Fracture of Metals at High Temperatures," p. 59-71.

How crystalline structure responds to the corresponding kinds of deformation. Takes as basis of comparison the structural changes in the standard tensile test at room temperature and contrasts with these the changes peculiar to slow straining at elevated temperatures. The comparison shows that the latter introduces new structural features, described as stress-recovery, equilibrium flow and boundary flow. 24 ref. (Q3, M27)

105-Q.* Interaction Between Crystal Slip and Grain Boundary Sliding During Creep. D. McLean. Paper from "Creep and Fracture of Metals at High Temperatures", p. 73-78.

Rotation of subcrystals in Al during creep is shown to be proportional to elongation, from which it is deduced that practically all the crystal deformation occurs by a normal glide process. The amount of grain boundary sliding occurring in Al and Cu during creep is shown to be proportional to elongation, suggesting that a linear interaction exists between crystal slip and grain boundary sliding. 22 ref. (Q3, Q24a; Al)

106-Q.* Some Fundamental Experiments on High Temperature Creep. John E. Dorn. Paper from "Creep and Fracture of Metals at High Temperatures", p. 89-138.

At high temperatures creep strain appears to be a function of a temperature compensated time and stress. X-ray analyses and plastic properties reveal that the same structures are developed at the same values following creep at the same stress. 50 ref. (Q3, 2-62)

107-Q.* Creep and Aging Effects in Solid Solutions. A. H. Cottrell. Paper from "Creep and Fracture of Metals at High Temperatures", p. 141-155.

If recovery occurs during creep the creep resistance is reduced; if strain aging occurs it is increased. Aging in substitutional alloys is accelerated during plastic flow. The minimum temperature for strain-age hardening during creep can be roughly estimated on the basis that vacancies are created during plastic flow and that these increase the rate of substitutional diffusion. 32 ref. (Q3, N7, N1)

108-Q.* Microstructure and Creep. J. W. Freeman and C. L. Corey. Paper from "Creep and Fracture of Metals at High Temperatures", p. 157-173.

Relationships between microstructure and creep reviewed from the viewpoint of extensive research on engineering alloys. Principles involved in solid solution, precipitation phenomena, cold work, multiphases, transformation structures, melting practice and grain size. 31 ref. (Q3, M27, N7)

109-Q.* Effect of Alloying on the Creep of Metals. L. Rotherham and C. R. Tottle. Paper from "Creep and Fracture of Metals at High Temperatures", p. 175-189.

Contributions to the understanding of creep have been made in two main directions, by analysis of experimentally determined creep curves, and by study of the factors affecting deformation. Using both methods, attempts have been made to predict the creep properties of alloys. The relationship between alloying and creep behavior appears capable of some degree of prediction. 66 ref. (Q3, 2-60)

110-Q.* Basic Principles of a Creep-Resisting Alloy. A. Constant and G. Delbart. Paper from "Creep and Fracture of Metals at High Temperatures", p. 191-214.

Essential part played in the resistance to creep by fine precipitates of additional phases, and the importance of heat treatment by which the nature, size and distribution of these precipitates can be controlled, with special reference to Cr-Mo-V steel. 27 ref. (Q3, N7, 2-64; AY, *Cr, Mo, V*)

111-Q.* Creep of Solid Solutions and Compounds in Metallic Systems. I. I. Kornilov. Paper from "Creep and Fracture of Metals at High Temperatures", p. 215-219.

Alloys of continuous solid solutions, Mg-Cd, Cu-Ni, Fe-Ni; alloys of limited solutions of binary systems, Al-Mg, Ni-Cr, NiAl; alloys of ternary systems, Fe-Ni-Cr, Ni-Cr-Al, Ni-Cr-Ti, were investigated. 21 ref. (Q3, 14-67, 14-68)

112-Q.* Effect of Changing Loads During Creep. Y. N. Rabotnov. Paper from "Creep and Fracture of Metals at High Temperatures", p. 221-225.

Certain possibilities of the phenomenological description of one-dimensional creep in tension. Where the dependence between stress and strain is linear, a universal method which can be applied to a wide range of possible cases is that of Volterra's theory of hereditary elasticity. 4 ref. (Q3, Q25n)

113-Q.* An Approach to the Problem of Intercrystalline Fracture. R. Eborall. Paper from "Creep and Fracture of Metals at High Temperatures", p. 229-241.

Intercrystalline fracture behavior may be affected by viscous sliding of the boundaries and by other factors involved in the fracture process itself, as well as by the hardness of the crystals, which has an important effect in raising the local stresses. The fracture characteristics of an alloy may be greatly affected by small alloying additions, improved properties being obtained by adding high-melting point elements of "unfavorable" size factor. 46 ref. (Q26, 2-60)

114-Q.* Theory of Accelerated Creep and Rupture. C. Crussard and J. Friedel. Paper from "Creep and Fracture of Metals at High Temperatures", p. 243-262.

Experimental results on creep-rupture tests show the factors influencing the stability of the metal under test. Of the different causes of instability, some oppose rupture (boundary migration, recrystallization), others promote rupture (boundary-glide in certain cases, intergranular oxidation through a "micro-Kirkendall effect"). Rupture occurs through the slow formation of intergranular microcracks, which is itself caused by some intrinsic mechanism related to the recovery process occurring during creep. 50 ref. (Q3)

115-Q.* Theory of Brittle and Ductile Fracture With Application to Creep Fracture, Based on the Dynamic Behavior of Dislocations and Condensation of Vacancies. A. Kochendorfer. Paper from "Creep and Fracture of Metals at High Temperatures", p. 263-280.

Suitable arrangements of dislocations lead to the break-up of the lattice if their energy is greater than the surface energy of the "holes" produced, a hole of this type being equivalent to a crack. A crack of atomic dimensions can be produced by a pile of single dislocations and grow to microscopic dimensions by means of further dislocations, the Griffith mechanism then leading to a brittle fracture. 62 ref. (Q26s, M26b)

116-Q.* Observations on Third Stage Creep and Fracture. C. H. M. Jenkins. Paper from "Creep and Fracture of Metals at High Temperatures", p. 287-298.

Tertiary creep and fracture have been studied in a number of materials by testing in a high vacuum to prevent oxidation over the range 15-950° C. The mode of deformation is greatly influenced by such changes as hardening by alloy additions, recrystallization, polygonization, spheroidization, age hardening, phase changes and even graphitization. The gradual onset of the effect of some of these factors as well as the development of cavities and cracks leads to tertiary creep. 7 ref. (Q3, Q26)

117-Q.* Tertiary Creep of Nimonic 80A. W. Betteridge. Paper from "Creep and Fracture of Metals at High Temperatures", p. 299-316.

Short-period low-stress torsional creep tests carried out at intervals during normal tensile creep experiments on Nimonic 80A have indicated that the number of available strain-promoting centers increases linearly with the tensile strain resulting from such centers and thus leads to the accelerating creep rate known as tertiary creep. This concept leads to a formula for the creep curve which agrees very accurately with the observed curves for this alloy. 4 ref. (Q3; SGA-h, Ni)

118-Q.* Grain Boundary Participation in Creep Deformation and Fracture. N. J. Grant. Paper from "Creep and Fracture of Metals at High Temperatures", p. 317-331.

Based on creep-rupture studies of a series of metals and alloys varying in composition from very high-purity aluminum to a complex age-hardenable gas turbine alloy, it is shown how alloying affects the behavior of grain boundary deformation and fracture. The ability of the grain boundary to recover is the major factor in determining the degree of embrittlement in high-temperature creep-rupture testing. 6 ref. (Q3, 2-60, Q26)

119-Q.* Investigations Into the Development of Intercrystalline Fractures in Various Steels Under Triaxial Stress. W. Siegfried. Paper from "Creep and Fracture of Metals at High Temperatures", p. 333-361.

Components used in mechanical engineering, even when made of heat resisting steels, often embody structural notches. As a result of the high temperatures at which heat resisting metals are utilized, modifications of the metal itself, such as aging, precipitation, recrystallization and alterations of phase, often occur with time. These processes greatly influence creep and must therefore be determined in some way when metals are tested. 15 ref. (Q3, 1-54, N general, Q25k)

120-Q.* Note on the Fracture Under Complex Stress Creep Conditions of a 0.5 Molybdenum Steel at 550° C. and a Commercially Pure Copper at 250° C. A. E. Johnson and N. E. Frost. Paper from "Creep and Fracture of Metals at High Temperatures", p. 363-382.

Little evidence is shown to support the Siegfried hypothesis that intercrystalline fracture is due to hydrostatic stress, and transcrystalline fracture to the maximum stress deviator. It is indicated by tests on both 0.5% Mo steel and Cu that the criterion of fracture may be the maximum principal (tensile) stress of the system imposed, irrespective of the actual physical nature of the fracture. (Q26r; AY, *Mo*, Cu-a)

121-Q.* Effect of a "V" Notch on the Tensile Creep Behaviour of a Molybdenum-Vanadium Steel. R. W. Ridley and H. J. Tapsell. Paper from "Creep and Fracture of Metals at High Temperatures", p. 383-401.

Tensile creep tests have been made on a Mo-V steel over the range 650-525° C. and at stresses of from 17 to 5 tons per sq. in. using test pieces in which a "V" notch had been machined circumferentially. The extent to which the presence of a "V" notch reduced the rupture

life of the material at the notch by virtue of stress concentration effects is discussed and the effect of the notch on the amount of creep occurring. 9 ref.
(Q3, Q23s; AY, *Mo, V*)

122-Q. (English.) **Relaxation Phenomena of the Fatigue of Metals.** Noboru Okagaki. *Institute of Scientific and Industrial Studies, Osaka University, Memoirs,* v. 14, 1957, p. 53-56.

Structural changes during fatigue may be detected by internal friction measurements. 22 ref.
(Q7, Q22)

123-Q. (English.) **Relaxation Phenomena During the Plastic Flow of Metals Under Rapid Loading.** Noboru Okagaki. *Institute of Scientific and Industrial Research, Osaka University, Bulletin,* v. 14, p. 57-68.

Stress relaxation phenomena in mild steel at high temperatures may be an effect of decrease of elastic modulus. 17 ref.
(Q21, Q22, Q24; CN)

124-Q. (French.) **Study of the Structural Variations During the Deformation of a Stable Austenite or a Mild Iron.** Albert Portevin, R. Tamhankar, Gilles Pompey, Jean Plateau and Guy Henry. *Comptes Rendus,* v. 245, Sept. 30, 1957, p. 1132-1135.

Slip, polygonization and migration of grains. (Q24a, N3; ST)

125-Q. (French.) **Decrease of Mechanical Resistance of Copper Power Lines by Heat.** E. Freudiger. *Pro-Metal,* no. 10, Aug. 1957, p. 853-857.

The degree of cold work of the wire and the quality of the Cu used are most important factors. Composition and degree of cold work are chosen with these factors considered. For service above 80° C., Cu is alloyed with Cd or Ag. 7 ref. (Q general; T1b; Cu, *Ag, Cd*)

126-Q. (German.) **Aging and Fatigue of Steels.** Werner Doring. *Eisenbahntechnische Rundschau,* v. 6, Aug. 1957, p. 306-313.
(Q7, N7a; ST)

127-Q. (German.) **Notch Tensile Test and Its Application for Prediction of Brittle Fracture. Pt. I.** H. Flössner and K. Matthaes. *Schweizer Archiv,* v. 23, Aug. 1957, p. 249-258.
38 ref. (Q27d, Q26s)

128-Q. (German.) **Electronic-Microscopic Examination of Slip Band Formation in Copper Crystals.** Siegfried Chader. *Zeitschrift für Physik,* v. 141, Aug. 1957, p. 73-102.
37 ref. (Q24a, M21e; Cu)

129-Q. (German.) **Low Temperature in Internal Friction of Metals.** Hans Donth. *Zeitschrift für Physik,* v. 149, Aug. 1957, p. 111-130.
38 ref. (Q22, 2-63)

130-Q. (German.) **Brittle Fractures in Reinforcing Steel.** Stefan Soretz. *Zeitschrift des Osterreichischen Ingenieur und Architekter-Vereins,* v. 102, Sept. 3, 1957, p. 205-210.

Cause of cracking. 7 ref.
(Q26; ST)

131-Q. (Japanese.) **Cracking of Steel Bolt Heads.** K. Yokoyama and K. Yamamoto. *Japan Society of Mechanical Engineers, Journal,* v. 60, Oct. 1957, p. 1080-1085.
(Q26q; 7-54; ST)

132-Q. (Japanese.) **Coating for Analysis of Plastic Behavior.** K. Kawata and S. Suzuki. *Scientific Research Institute, Reports,* v. 33, July 1957, p. 177-184.

Study of plastic behavior (bending and tension) of steel with epoxy-rubber coating. Observation of slip phenomena.
(Q5, Q27a, Q24a; ST)

133-Q. (Russian.) **Effect of Structure on the Toughness of Titanium Carbide Inserts.** P. K. Mikhailova. *Stanki i Instrument,* v. 28, June 1957, p. 26-27.

Annular grain form definitely lowers the toughness of inserts, and must be regarded as defective.
(Q23, 3-71; Ti, 6-69)

134-Q. (Russian.) **Characteristics of Tungsten Carbide Cutters Bonded With Nickel or Cobalt.** N. F. Kazakov and M. N. Andrianova. *Stanki i Instrument,* v. 28, June 1957, p. 24-25. (Also available as Henry Brutcher Translation no. 3966, Altadena, Calif.)

Rate of wear of cutters bonded with Ni is higher than that of those bonded with Co. On the other hand, the wear shown by cutters bonded with Ni-Co is less than that of either Ni, or Co bonded bits.
(Q9n, T6n; W, *Ni, Co,* 6-69)

135-Q. (Russian.) **Cutters Cast From High Speed Steel.** M. S. Polak. *Stanki i Instrument,* v. 28, July 1957, p. 30-31.

Cobalt enters into solid solution and contributes desired hardness; physical characteristics are between those of metallic carbide components and alloys of solid solution type. Stellite-type alloys may be used in place of high-speed steel.
(Q29, T26n, TS-m)

136-Q.* **On the Necessity of Fundamental and Widened Research in Strength of Materials.** M. V. Zaustin. *ASTM Bulletin,* no. 226, Dec. 1957, p. 52-61.

Suggestions for the improvement of methods of testing metal from the point of view of tension, compression, shear strength, impact, stress, ductility, fatigue, to enable more efficient design. 11 ref.
(Q general, 1-54)

137-Q.* **Brittle Fracture of Metals at Atmospheric and Sub-Zero Temperatures.** C. F. Tipper. *Metallurgical Reviews,* v. 2, 1957, p. 195-261.

Conditions which cause brittle fracture in a ductile metal; deformation and fracture of crystalline aggregates; development of patterns on fracture surfaces; effect of a notch; effect of high rates of loading; effect of pre-strain on fracture; fatigue; assessment of brittleness by mechanical tests; types of notch bar test; metallurgical factors affecting fracture in steels and nonferrous metals; initiation and propagation of fracture. 247 ref. (Q26)

138-Q.* **Watch Out for Compression Loads.** *Product Engineering,* v. 28, Dec. 9, 1957, p. 72-75.

Effect of cold working; temperature effects; compression creep; sheet properties versus bar; how compression tests are run. (Q28)

139-Q.* **Residual Stresses From Machining Operations. Pt. 2.** Erik K. Henriksen. *Steel Processing and Conversion,* v. 43, Dec. 1957, p. 698-699, 710-711.

Materials tested were austenitic Mn steel and cast iron, Armco iron, free-machining and cast carbon steel. 36 ref. (Q25, G18; ST, CI, Fe)

140-Q. (Czech.) **Some Properties of Semi-Finished Duralumin Products and Their Heat Treatment.** Petr Skulari. *Hutnické Listy,* v. 12, Oct. 1957, p. 949-960.

Fabrication methods producing stress-free material of good formability. 10 ref. (Q23q, J27; Al)

141-Q. (English.) **Nomographic Method for Evaluating X-Ray Back-Reflection Patterns Used in the Computation of Residual Stresses in Steels.** I. S. Szanto. *Periodica Polytechnica,* v. 1, no. 2, 1957, p. 87-101.
7 ref. (Q25h, M22g; ST)

142-Q.* (German.) **Internal Stresses in Hardened Tool Steels and Development of Grinding Cracks.** Hans Bühler and Walter Schepp. *Stahl und Eisen,* v. 77, Nov. 14, 1957, p. 1686-1690.

Effect of transformation on the distribution of internal stresses in cylindrical specimens taken from various Ni steels poor in carbon. Distribution of stresses in specimens partly water quenched and taken from alloys containing: (a) 0.05% C and 17% Ni, (b) 1% C and 1.5% Cr, as well as from plain carbon toolsteels containing (c) 1% C and (d) 1.3% C. Magnitude of internal stresses present on the fresh surface after removal of layers of different thicknesses.
(Q25, J26; TS, 9-72)

143-Q. (German.) **Structure and Surfaces of Metal in Cold Forming.** H. Wiegand. *Werkstatt und Betrieb,* v. 90, Nov. 1957, p. 769-775.
(Q23q, 3-71)

144-Q. (Russian.) **Relieving Residual Stresses From Cold Worked Bars by Means of Axial Strain.** I. V. Kudryavtzev and L. M. Rosenman. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 7-13.

Samples were passed through a fixture with three rolls to produce surface stresses, then subjected to various fatigue tests. It is possible to conserve a part of the residual loading by means of axial loading. (Q25h, Q7, 4-55)

145-Q. (Russian.) **Process of Relaxation Under Condition of Repeated Stresses.** T. I. Volkova. *Metallovedenie i Obrabotka Metallov,* no. 7, July 1957, p. 13-18.

Certain mechanical parts which are habitually exposed to high temperatures or to stresses develop resistance to relaxation. It is desirable to avoid higher than working temperatures even for a short time between subsequent working loads. 6 ref. (Q25p, Q3, 2-62)

146-Q. (Russian.) **Estimation of Tendency of Steel to Become Brittle Under Service Conditions.** E. M. Shevandin. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 949-953.
8 ref. (Q26s; ST)

147-Q. (Russian.) **Method of Investigation of Metal Deformation at High Temperatures.** E. I. Belskii and R. I. Tomilin. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 957-958.
4 ref. (Q general, 2-62)

148-Q.* **Mechanism of Fatigue: A Review.** R. C. A. Thurston. *Canadian Mining and Metallurgical Bulletin,* v. 50, Dec. 1957, p. 708-716. (*Transactions,* v. 50, 1957, p. 390-398.)

Present-day theory of dislocations, mechanism of slip, initiation of fatigue cracks, subsequent propagation. 43 ref. (Q7, Q24a)

149-Q.* **Fatigue in Mining and Construction Equipment.** B. M. Hamilton. *Canadian Mining and Metallurgical Bulletin,* v. 50, Dec. 1957, p. 717-724.

Fatigue failures occur in load-carrying members of machine parts when they are subject to alternating or cyclic stresses. Fatigue is, therefore, most commonly found in moving parts which may become de-

flected due to overloading and poor alignment. However, intermittent shock loading or vibration can also contribute to fatigue failure in both moving and stationary parts.
(Q7, T28)

150-Q. Wrought Aluminum Alloys in Order of Increasing Ultimate Strength. *Machinery,* v. 64, Oct. 1957, p. 257-258.

Lists the alloys and gives tensile strength, yield strength and hardness values.
(Q27a, Q23b, Q29n; Al, 4)

151-Q.* Micro-Hardness Testing. R. Wall. *Metal Industry,* v. 91, Dec. 20, 1957, p. 521-522.

Experiences and results obtained over five years both from the laboratory point of view and as a production quality control method. (Q29q)

152-Q.* Elastic Moduli and Tensile Properties of Titanium-Carbon and Titanium-Aluminium-Carbon Alloys. H. Brooks, G. I. Lewis and J. I. M. Forsyth. *Metallurgia,* v. 56, Dec. 1957, p. 277-282.

Although tensile tests and dynamic measurements on hot rolled strip confirmed the beneficial effect of carbon additions on the tensile and shear moduli of Ti, carbon is considered unlikely to be used as a modulus-raising addition in commercial shear alloys unless its effect on service temperature ductility can be lessened. Ternary alloys containing both C and Al in amounts sufficient to give a significant improvement in modulus were found to be brittle. 8 ref.
(Q21a, Q27a, 2-60; Ti)

153-Q. Micro-Hardness Testing. T. E. W. Preston. *Metalworking Production,* v. 101, Oct. 11, 1957, p. 1833-1836.

Microhardness testing unit attached to microscope barrel accurately measures pyramid indentations as small as 7 microns in diagonal.
(Q29q, 1-53)

154-Q. How to Measure Principal Stresses. C. C. Perry. *Product Engineering,* v. 28, Oct. 14, 1957, p. 101-105.

Failure theories in stress analysis; distribution patterns for normal stresses, equations relating strain-gage readings and principal stresses and a method for using only one strain gage to find principal stresses. (Q25, X28j)

155-Q. Adhesion Testing. Peter J. Larsen. *Rubber Age,* v. 82, Dec. 1957, p. 485-486.

Types of tests used to determine adhesion value of metal-rubber bonds. (Q10c; K11c)

156-Q. How to Upgrade Cold Finished Steel. *Steel,* v. 141, Dec. 23, 1957, p. 66-69.

Results of experiments on higher reductions show that potential strength and toughness of carbon steels are practically untapped.
(Q23q, Q23p, Q27a, 3-68; CN)

157-Q. Mechanical Properties of Unalloyed Chromium. S. A. Spachner and W. Rostoker. Armour Research Foundation. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121895, Dec. 1957, 74 p. $2.
(Q general; Cr)

158-Q. Effect of Elevated Temperature on the Fatigue Strength of Sintered Aluminum Powder. W. S. Hyler and H. J. Grover. Battelle Memorial Institute. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131225, Aug. 1955, 50 p. $1.25.
(Q7a, 2-62; Al, 6-72)

159-Q. Effects of Physical Variables on Delayed Failure in Steel. R. D. Johnson, H. H. Johnson, J. G. Morlet and A. R. Troiano. Case Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 121456, 44 p. $1.25.

Effects of three specific variables —hydrogen distribution, test temperature and prestressing—on hydrogen-induced brittle fracture of 4340 steel in static fatigue.
(Q7b, Q26s; ST)

160-Q. New Concept of Hydrogen Embrittlement in Steel. J. G. Morlet, H. H. Johnson and A. R. Troiano. Case Institute of Technology. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131200, Mar. 1957, 50 p. $1.25.
(Q26s; ST)

161-Q. Dynamic Properties of Solids. Final Report. T. R. Cuykendall and H. S. Sack. Cornell University. (Office of Naval Research.) *U. S. Office of Technical Services,* PB 121701, Nov. 1955, 115 p. $3.

Determination of the elastic modulus and the internal friction of solids under alternating stresses.
(Q21; Q22)

162-Q. Evaluation of the Engineering Properties of Titanium Carbide Base Cermets. J. C. Redmond, R. J. Reintgen, J. R. Fenton and M. E. Simon. Kennametal Inc. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131026, July 1956, 67 p. $1.75.
(Q general, 6-20; Ti)

163-Q. Steady-State Creep of Crystals. J. Weertman. Naval Research Laboratory. *U. S. Office of Technical Services,* PB 131132, Aug. 1957, 10 p. $.50.
(Q3n)

164-Q. Design Properties in High-Strength Steels in the Presence of Stress Concentrations and Hydrogen Embrittlement. Pt. 3. The Response of High-Strength Steels in the Range of 180,000 to 300.000 Psi. to Hydrogen Embrittlement From Cadmium Electroplating. E. P. Klier, B. B. Muvdi and G. Sachs. Syracuse University. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131034, Mar. 1957, 129 p. $3.25.
(Q26s, L17; ST, SGB-a, *Cd*)

165-Q. Application of a New Structural Index to Compare Titanium Alloys With Other Materials in Airframe Structures. L. R. Jackson and S. A. Gordon. Titanium Metallurgical Laboratory, Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121605, Dec. 1955, 33 p. $1.

Reliable method of evaluating high-temperature performance of materials such as Ti, in comparison with other materials, when only compressible stress-strain curves are available at each temperature.
(Q general, 1-62, T24a; Ti)

166-Q. Flow Properties, Deformation Textures and Slip Systems of Titanium and Titanium Alloys. F. C. Holden, D. N. Williams, W. E. Riley and R. I. Jaffee. Titanium Metallurgical Laboratory, Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121608, Jan. 1956, 102 p. $2.75.

Methods used to predict formability; flow properties for a number of experimental Ti alloys tabulated and compared.
(Q23q, P11g, Q24a; Ti)

167-Q. Antigalling Coatings and Lubricants for Titanium. E. L. White, P. D. Miller and R. S. Peoples. Titanium Metallurgical Laboratory, Battelle Memorial Institute. *U. S. Office of Technical Services,* PB 121610, Feb. 1956, 54 p. $1.50.

Wear resistance can be improved by oxide, nitride, and carbide case hardenings and coatings.
(Q9, 18-73; NM-h, Ti)

168-Q. Investigation of the Fatigue Characteristics of Leaded Alloy Steels. G. W. Brock and G. M. Sinclair. University of Illinois for Bureau of Ordnance. *U. S. Office of Technical Services,* PB 121834, Mar. 1957, 57 p. $1.50.
(Q7; AY, *Pb*)

169-Q. Analysis of Dynamic Creep Considering Strain Rate Effects. F. H. Vitovec. University of Minnesota. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131256, May 1957, 21 p. $.75.
(Q3, 3-67)

170-Q. Analytical Methods for Determining Specific Damping Energy Considering Stress Distribution. E. R. Podnieks and B. J. Lazan. University of Minnesota. (Wright Air Development Center.) *U. S. Office of Technical Services,* PB 131250, June 1957, 42 p. $1.25.
(Q8)

171-Q. Engineering Application of the Absolute Rate Theory to the Creep of Lead. M. B. Hogan. University of Utah. (Office of Naval Research.) *U. S. Office of Technical Services,* PB 121127, May 1955, 83 p. $2.25.

Data from three different published sources were analyzed through the absolute rate theory based on a four-element mechanical model. Metallurgical complexity of Pb and the influence of alloying elements and other factors on its mechanical properties were also examined.
(Q3, 2-60; Pb)

172-Q. Engineering Application of the Absolute Rate Theory to the Creep of Some Aluminum Alloys. M. B. Hogan. University of Utah. (Office of Naval Research.) *U. S. Office of Technical Services,* PB 131139, June 1956, 61 p. $1.75.

Creep data for seven cast and three wrought Al alloys analyzed in terms of a four-element mechanical model and the absolute rate theory. Values of the modulus of elasticity included. (Q3, Q21; Al)

173-Q. An Electronic Signaller to Reduce Quench-Cracking of Steel. L. D. Jaffee, D. C. Buffum and I. L. Preble. Watertown Arsenal Laboratory. *U. S. Office of Technical Services,* PB 131111, June 1952, 38 p. $1.

An instrument which responds with an electrical signal when a steel part being quenched has hardened sufficiently.
(Q29n, J26, 1-53; ST, 9-72)

174-Q. Description of Some Current Methods for Determining Creep Properties Under Compressive Bearing and Shear Type of Loading. E. L. Horne. Wright Air Development Center. *U. S. Office of Technical Services,* PB 131259, June 1957, 32 p. $1.
(Q3, 1-54)

175-Q. Tensile Deformation of Aluminum as a Function of Temperature, Strain Rate and Grain Size. R. P. Carreker, Jr., and W. R. Hibbard, Jr. Wright Air Development Center. *U. S. Office of Technical Services,* PB 121143, July 1955, 27 p. $.75.
(Q27: 2-62. 2-59. 3-68; Al)

176-Q.* **Improved Notch Toughness of Experimental Semikilled Steels Over One Inch in Thickness.** R. W. Vanderbeck. *Welding Journal,* v. 37, Jan. 1958, 10s-20s.

Test results indicate that a semikilled steel containing about 0.16% C and 1.20% Mn may have sufficient notch toughness to be considered as an emergency substitute, or possibly as an alternate, for ABS Class C killed steel in thicknesses over 1 in. to 1¾ in. inclusive. 12 ref. (Q6n; ST-k)

177-Q.* **Preheating — Residual Stresses—Stress Relieving.** W. Spraragen. *Welding Journal,* v. 37, Jan. 1958, p. 21s.

Methods of stress relief; comparison of thermal stress-relief treatment with mechanical stress relief treatment. (Q25h, J1a, G23; 7-51)

178-Q.* **Fatigue Strength of Silver-Alloy Brazed Joints in Steel.** C. H. Chatfield and Sam Tour. *Welding Journal,* v. 37, Jan. 1958, p. 37s-40s.

Laboratory investigation leads to quantitative information regarding the fatigue strength of butt joints in steel brazed with B-Ag-1 Alloy. 4 ref. (Q7a; ST, 7-52)

179-Q. **Thermal and Temper Brittleness of Ferritic (Pearlitic) Steels.** P. B. Mikhailov-Mikheev. *Metallovedenie i Obrabotka Metallov,* no. 2, Feb. 1956, p. 23-33. (Henry Brutcher Translation no. 3977, Altadena, Calif.)

Previously abstracted from original. See item 421-Q, 1956. (Q26s, J29; ST, SS)

180-Q. (Russian.) **Method of Steel Testing for Impact Fatigue.** N. F. Vyaznikov and S. S. Ermakov. *Zavodskaya Laboratoria,* v. 23, Sept. 1957, p. 1095-1097.

3 ref. (Q6, Q7, 1-54; ST)

181-Q.* (Spanish.) **Measurement of Internal Stresses in Electrolytic Deposits of Metals.** Francisco Munoz del Corral and Lamberto A. Rubio Felipe. *Instituto del Hierro y del Acero,* v. 10, July-Sept. 1957, p. 355-363.

Experiments designed to prove reproducibility of results in calculation of internal stresses on basis of simple mechanical method. Copper and iron strips were held straight in various types of baths during deposition of Cu, Ni, Cr. One end of strip was then released and allowed to curve freely until reaching equilibrium position. Formula based on radius of curvature, thickness of base metal and thickness of deposit gives internal stress values. 4 ref. (Q25; *Cu, Ni, Cr,* 8-62)

182-Q.* **Improved Fabrication Techniques and Lower Cost Favor Titanium's Use.** *Corrosion,* v. 14, Jan. 1958, p. 119-122.

Fabrication characteristics of titanium in connection with proposed use for chemical equipment. Principal physical properties of two grades of commercially pure Ti listed and compared with Type 304 stainless steel. Recommendations regarding procedure in welding Ti. 6 ref. (Q general, K general, 17-57; Ti)

183-Q.* **Effect of Heat-Treatment on the Creep and Creep-Rupture Behavior of a High-Purity Alpha Copper Aluminium Alloy at 300 and 500° C.** J. P. Dennison. *Institute of Metals, Journal,* v. 85, Dec. 1957, p. 177-181.

Creep and creep-rupture tests have been carried out on a high-purity alpha Cu-Al alloy at 300 and 500° C. Effect of the treatment by which particular grain sizes were achieved, as well as that of actual grain size before testing. At 300° C., where fine-grained specimens were the most resistance to rupture, and at 500° C., where those having coarse grain sizes gave superior creep-rupture lives, recrystallization at a high temperature during preparation of the specimen resulted in an inferior performance in both creep and creep-rupture tests. 20 ref. (Q3m, M27c; Cu, Al)

184-Q.* **High Tensile Stainless.** *Iron and Steel,* v. 30, Oct. 1957, p. 487-488.

Data on tensile and other mechanical properties of FV520, a new high-tensile stainless at room and elevated temperatures following various heat treatments. Magnetic properties, electrical resistivity, thermal expansion and other physical properties. The weldable stainless steel is available as forgings, castings, sheet or wire and has composition of 0.07% C, 1.0% Si, 2.0% Mn, 14 to 18% Cr, 4 to 7% Ni, 1 to 3% Cu, 1 to 3% Mo and 0.5% Ti, with the remaining percentage iron. (Q general, P general; SS, SGB-a)

185-Q. **Steels at Elevated Temperatures.** J. D. Murray. *Iron and Steel,* v. 30, Oct. 1957, p. 493-495.

Essential properties of high-temperature steels including oxidation resistance, fatigue properties, physical properties influencing thermal stress and creep resistance. Effect of deoxidation practice and mechanical working on creep behavior of steel. (To be concluded.) 9 ref. (Q general, Q3, 2-62; ST, SGA-h)

186-Q. **High-Boron Alloy Steels.** T. H. Middleham, J. R. Rait and E. W. Colbeck. *Iron and Steel,* v. 30, Oct. 9, 1957, p. 526-534.

Reviews literature on Fe-B system and alloys. Effects of Fe addition on hot workability of B steels and melting, casting, forging, rolling, extruding and machining of B steels containing Al. Metallographic features of cast B steels with varying Al contents. Data on constitution and mechanical properties of B alloys as determined by microhardness, dilatation, X-ray diffraction and other studies. Welding properties and welding and brazing techniques. (Q general, M24; ST, *B, Al*)

187-Q.* **Steels at Elevated Temperatures.** J. D. Murray. *Iron and Steel,* v. 30, Nov. 1957, p. 597-601.

Summarizes literature and experimental data concerning influence of metallurgical variables on creep and rupture strength of steel. Solid solution strengthening and precipitation phenomena are considered controlling factors, with transformation products of secondary importance. Methods of obtaining creep data compared; procedure employing constant stress and temperature. 19 ref. (Q3m, 2-62; ST)

188-Q. **Micro-Hardness Testing.** R. Wall. *Iron and Steel,* v. 30, Nov. 1957, p. 611-612.

8 ref. (Q29q)

189-Q. **Plated Finishes. The Choice Widens.** Robert T. Gore and Robert M. MacIntosh. *Product Engineering,* v. 28, Oct. 28, 1957, p. 81-84.

Application, corrosion resistance, finish adhesion, hardness, abrasion resistance, ductility and reflectivity of electroplated deposits of single metals or alloys. (Q general, P17a; 8-62)

190-Q.* (Italian.) **Influence of Heat Treatment on the Fatigue Resistance of Ergal Alloy.** F. Gatto. *Alluminio,* v. 26, Nov. 1957, p. 463-467.

Tests of Al alloy in different heat treat states showed that average fatigue resistance under rotary bending is not appreciably affected by hardening or aging conditions; that variations in resistance are linked to interaction between internal stresses produced during hardening and method of artificial aging. 10 ref. (Q7a, 2-64; Al)

191-Q. (Russian.) **Stable and Unstable Macrolocalization of Plastic Deformation on Static Torsion.** F. P. Rybalko and M. V. Yakutovich. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 450-454.

10 ref. (Q24, Q1)

192-Q. (Russian.) **Study of Nonuniformity of Plastic Deformation on Torsion by Engraved Grids.** T. K. Zilova, N. I. Demina and Ya. B. Fridman. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 455-469.

9 ref. (Q24, Q1)

193-Q.* (Russian.) **Critical Interval of Brittleness of Transformer Steel.** N. I. Lapkin, G. N. Shubin and S. I. Doroshek. *Fizika Metallov i Metallovdenie,* v. 4, no. 3, 1957, p. 478-482.

Plastic properties of steels containing from 1 to 5.8% Si in temperature interval from −80 to 300° C. Determination of critical interval of brittleness in respect to Si content. Application of low-temperature preheating (100-250° C.) increases ductility of transformer steel 20-fold. 4 ref. (Q23p; Q26s; ST, SGA-r)

194-Q. (Russian.) **Brittle Fracture of Red Copper.** S. K. Maksimov. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 483-489.

Brittleness of Cu at elevated temperatures under dynamic and static loads. 5 ref. (Q26s, 2-62; Cu)

195-Q. (Russian.) **Investigation of State of Strain in Surface Layers of Friction With Sign-Changing Slip.** K. V. Savitskii and Yu. P. Geraskevich. *Fizika Metallov i Metallovedenie,* v. 4, no. 3, 1957, p. 519-526.

Investigation of the character of surface layers and heat stability of Fe, Cu, Al and duraluminum subjected to unidirectional and reciprocal friction. 11 ref. (Q9p, P11; Al, Cu, Fe)

196-Q. (Russian.) **Influence of Admissible Composition Variations of Soft Sheet Steel Upon Impact Resistance and Aging.** I. E. Brainin and N. V. Gubenko. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 2-4.

Increase of carbon, phosphorus, manganese and sulphur contents decreases impact resistance but has no influence on aging. Increase of silicon contents has no influence on impact resistance but decreases rate of aging. 3 ref. (Q6, N7a, 2-60, 4-53; ST, *C, Mn, P*)

197-Q. (Russian.) **Wear Resistance of Steel Surfaces Saturated With Carbide-Forming Elements.** G. I. Dubinin. *Metallovedenie i Obrabotka Metallov,* v. 1, Sept. 1957, p. 21-25.

3 ref. (Q9n; ST, 14-68)

198-Q. (Book.) **Creep and Fracture of Metals at High Temperatures.** 419 p. 1957. Philosophical Library Inc., 15 East 40th St., New York 16, N. Y. $12.00.

Proceedings of a symposium held at the National Physical Laboratory, Teddington, England, in May-June 1954. Papers abstracted separately. (Q3, Q26, 2-62)

R Corrosion

80-R. Corrosion Fatigue. T. D. Weaver. *Chemistry and Industry,* v. 36, Sept. 7, 1957, p. 1194.

Deleterious effect of combined corrosion and cyclic stress, mechanism of failure under such conditions, counter-measures which can be taken. 13 ref. (R1e; ST)

81-R.* Action of Fused Nitrates of Lithium, Sodium and Potassium on Nickel, Copper, Duralumin and Certain Steels. E. I. Gurovich. *Journal of Applied Chemistry of the U.S.S.R.,* v. 29, Sept. 1956, p. 1461-1466. (Translated by Consultants Bureau, Inc.)

Corrosion by nitrates was found to depend on time and temperature and to consist of two processes, namely, solution of metal and oxide film formation. Data obtained introduced certain complications into observed dependence of corrosion on position of cations of nitrates in Mendeleev's periodic table. Some of the films formed on the metals may be of practical importance for decorative coloration of the metals or as a means of preparing the surface of carbon steels for painting, to provide a firmer attachment of the paint coating. 26 ref. (R6k; Ni, Cu, Al, ST)

82-R.* Use of Naphthenate Soap for Protection of Powdered Copper Against Corrosion. A. V. Pomosov and E. E. Krymakova. *Journal of Applied Chemistry of the U.S.S.R.,* v. 29, Sept. 1956, p. 1543-1544. (Translated by Consultants Bureau, Inc.)

Reliable results are obtained by treatment of Cu powder with a soda solution containing 0.05% naphthenate soap and 0.05% soda. 4 ref. (R10a; Cu, 6-68)

83-R. Additions on the Hot Water and Steam Corrosion Resistance of Zirconium. G. L. Frederic, R. H. Robertson and R. L. Carpenter. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BM-11-92, July 9, 1954, 18 p. (CMA)

Additions of Cb and Ta to Zr-1Sn did not improve corrosion resistance to hot water and steam. (R4d, 2-60; Zr, *Sn, Ta, Cb*)

84-R. Effects of Ternary Alloying Additions on the Corrosion Resistance of Epsilon-Phase Uranium-Zirconium Alloys. J. E. Reynolds, et al. Battelle Memorial Institute. *U. S. Atomic Energy Commission,* BMI-1087, Apr. 27, 1956, 31 p. (CMA)

5 ref. (R4d, 2-60; U, Zr, *Cr, Ti, Al, Ta, W, V, Pt*)

85-R. Analysis of Zircaloy II Corroded by Diphenyl. F. D. Leipziger. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-FDL-1, May 31, 1956, 8 p. (CMA)

Corrosion resistance of Zircaloy-2 to diphenyl. (R7g; Zr)

86-R. Corrosion Studies of Crystal Bar Zirconium in Organic Coolants. J. G. Gratton. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission,* KAPL-M-JGG-1, Oct. 18, 1956, 9 p. (CMA)

(R7; Zr, 5-67)

87-R. (Czech.) **Application of 2 Methyl Butanol—2-Chromate as an Inhibitor.** L. Cerveny and R. Bartonicek. *Czechoslovak Chemical Communication, Collections,* v. 22, June 1957, p. 908-913.

For passivation of steel. 8 ref. (R10c; ST)

88-R. (German.) **Corrosion Studies. Pt. 12. Influence of Strain Energy Upon the Solution Speed of Metals.** I. Sekerha and O. Vanicek. *Czechoslovak Chemical Communications, Collection,* v. 22, June 1957, p. 705-711.

11 ref. (R1d; Zn)

89-R. (German.) **Corrosion Studies. Pt. 13. Corrosion of Zinc in Chloride Solutions.** I. Sekerha and K. Smrcek. *Czechoslovak Chemical Communications, Collection,* v. 22, June 1957, p. 712-719.

17 ref. (R6g; Zn)

90-R. (German.) **Corrosion as an Electrochemical Process.** F. W. Hill. *Praktische Chemie,* v. 8, Aug. 1957, p. 238-243.

Form and extent of corrosion of steel construction when submitted to uncontrolled electrochemical reactions. (R1a; ST)

91-R. (German.) **Service Life of Sheet Steel Pilings in Fresh Water Installations.** Otto Schneider. *Wasser und Boden,* v. 9, Sept. 1957, p. 358-360.

(R4a; ST)

92-R. (German.) **Corrosion and Corrosion Tests.** Anton Schwartz. *VDI Zeitschrift,* v. 99, Sept. 1, 1957, p. 1249-1250.

23 ref. (R1, R11)

93-R.* (Italian.) **Kinetics of the Dissolution of Iron in an Acid Medium. Pt. 1. Action of Adsorbed Hydrogen.** Liliana Felloni and Giampaolo Bolognesi. *Annali di Chimica,* v. 47, Sept. 1957, p. 985-995.

Dissolution tests in HCl at 25° C. were conducted on samples of Armco iron of various thickness-area ratios. It appears, from analysis of the results, that the reaction consisting of combination of H atoms takes place at active points on the metal surfaces. The process of absorption, which occurs at different points, after achievement of a dynamic equilibrium inside the metal, appears to influence the total process of dissolution of iron and evolution of H, either as a result of polarization, through attainment of a certain maximum speed of diffusion, or as a result of a change, caused by absorption, in the crystal lattice. 17 ref. (R6g; Fe, *H*)

94-R.* (Italian.) **Kinetics of the Dissolution of Iron in an Acid Medium. Pt. 2. Action of Certain Additives in Relation to Adsorbed Hydrogen.** Liliana Felloni and Giampaolo Bolognesi. *Annali di Chimica,* v. 47, Sept. 1957, p. 996-1004.

Dissolution tests in HCl were conducted on samples of Armco iron to observe interaction caused by addition of inhibitor on quantity of H adsorbed. Iron dissolved at end of tests was determined, and kinetics of evolution of H, in presence of ethyl alcohol and of o-tolylthiourea, were followed. Action of inhibitors is characterized as deterrent to increase in overvoltage. 11 ref. (R6g, R10b; Fe, *H*)

95-R. (Japanese.) **Anticorrosive Effects of Maleic Anhydride Derivatives.** N. Wada, Y. Shigeno, Y. Shimoda and S. Nakagawa. *Chemical Society of Japan, Journal: Industrial Chemistry Section,* v. 60, Aug. 1957, p. 1042-1044.

(R10b)

96-R. (Italian.) **Contribution to the Theory of the Phenomena of Electrochemical Corrosion.** Roberto Piontelli. *Istituto Lombardo di Scienze e Lettere, Rendiconti,* v. 91, no. 1, 1957, p. 237-256.

Theoretical presentation of general aspects of electrochemical corrosion and of conditions of immunity, cathodic protection, and passivity. 10 ref. (R1a)

97-R. (Italian.) **Corrosion by Stray Currents.** T. A. Turco. *Pitture e Vernici,* v. 13, Sept. 1957, p. 589-592.

Mechanism of corrosion by stray currents and newer methods of combatting same, including electrical measures and coatings of various types. 8 ref. (R1j)

98-R. Examination of a Failed Type 347 Stainless Steel Drum Used for the Storage and Shipping of Fuming Nitric Acid. P. R. Kosting and A. K. Wong. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131112, June 1954, 23 p. $.75.

(R7b, W12c; SS)

99-R. (French.) **Corrosion-Erosion.** I. Ming-Feng and B. G. Rightmire. *Navires, Ports et Chantiers,* v. 8, Oct. 1957, p. 757-759, 785.

Mechanism of corrosion; a curve represents the weight of lost metal as a function of number of effective cycles. (R1c)

100-R. (German.) **Resistance to Corrosion of Condenser Tubes Made of Copper Alloys.** K. Eichhorn. *Werkstoffe und Korrosion,* v. 8, Nov. 1957, p. 657-668.

35 ref. (R4, 4-60; Cu)

101-R.* (German.) **Sodium Benzoate as Corrosion Inhibitor in Aqueous Dispersions.** H. J. Freier and W. Geilenkirchen. *Werkstoffe und Korrosion,* v. 8, Nov. 1957, p. 673-677.

Sheet metals intended for containers for aqueous varnish dispersions are protected from corrosion by additives of sodium benzoate, or sodium benzoate-sodium nitrite. Protection depends mainly on acidity. Additions of 2% or less are effective. 9 ref. (R10b)

102-R. (German.) **Electrochemical Mechanism of the Inhibiting Action of Lead Oxides on Iron.** J. D'Ans, W. Breckheimer and H. J. Schuster. *Werkstoffe und Korrosion,* v. 8, Nov. 1957, p. 677-688.

Lead dioxide is ineffective because its high electric conductivity causes local cells. Reaction compounds of divalent Pb generate a protective coating on the basis metal which protects against corrosion. 7 ref. (R1, 2-66; Pb, Fe)

103-R.* (German.) **Protection Against Corrosion During Naval Transport in Tropical Climates.** Hermann Determann. *Werkstoffe und Korrosion,* v. 8, Nov. 1957, p. 689-694.

Special observations were made during trial runs on steel products. Insufficient amounts of silica gel as drying medium may result in slight to severe corrosion depending on tightness of package. Bacteria favor corrosion and bananas can breed bacteria. Anticorrosive greases and wax help. Vapor phase inhibitor is a good anticorrosive. 7 ref. (R3s, R10)

104-R.* (German.) **Corrosion of Metal Surfaces in Tropical Climates.** O. Marsch. *Werkstoffe und Korrosion,* v. 8, Nov. 1957, p. 688.

Tropical conditions are simulated by testing products at 40° C. and 90% relative humidity. Products made of nonferrous metals or with varnished surfaces are preferred. Electric equipment with bright surfaces must be electroplated with Cu, Ni, Zn, Au or Ag. Sweating of insulating materials causes corrosion. (R3s)

105-R.* Galvanic Corrosion of Aluminum-Steel and Aluminum-Lead Couples. M. J. Pryor. *Corrosion,* v. 14, Jan. 1958, p. 1t.

The galvanic current and the corrosion rate of the Al are proportional to the area of the steel cathode and are independent of the area of the Al anode. Factors increasing the access of oxygen to the cathode surface, such as stirring and aeration, increase the galvanic corrosion rate proportionately.
(R1a; Al, ST, Pb)

106-R.* Oxidation of Molybdenum. E. S. Jones, J. F. Mosher, Rudolph Speiser and J. W. Spretnak. *Corrosion,* v. 14, Jan. 1958, p. 2t-8t.

Rate of evaporation of MoO_3 and the mechanism of Mo oxidation were determined. After an initial parabolic dependence of weight change upon time the rate of oxidation became linear. The outer MoO_3 layer is nonprotective so that the rate of oxidation of the suboxide to the trioxide at the suboxide-trioxide interface is equal to the rate of diffusion of oxygen through the suboxide film to the metal-suboxide interface. 29 ref. (R1h; Mo)

107-R.* Effect of No, HNO_2 and HNO_3 on Corrosion of Stainless Steel by H_2SO_4. W. P. McKinnell, Jr., L. F. Lockwood, R. Speiser, F. H. Beck and M. G. Fontana. *Corrosion,* v. 14, Jan. 1958, p. 9t-12t.

Specimens of Type 302 stainless steel, activated by abrading on 240-grit emery cloth and exposed to 10% H_2SO_4 solutions, were passivated by bubbling nitric oxide through the solution. Bubbling oxygen through the solution did not passivate abraded specimens. Abraded specimens exposed to an atmosphere of nitric oxide before immersion in nitric oxide-free H_2SO_4 remained active. 7 ref. (R6g, R10c; SS)

108-R.* Kinetic Study of Acid Corrosion of Cadmium. Henry Weaver, Jr., and Cecil C. Lynch. *Corrosion,* v. 14, Jan. 1958, p. 13t-14t.

Kinetics of the reaction of dilute hydrochloric acid with Cd metal, molded, electroplated on brass, and dipped on brass, investigated by calibrated conductance measurements. The effect of annealing molded Cd samples was to reduce the corrosion rate. The reaction rates at three acid concentrations and at three temperatures were determined. 8 ref. (R6, 2-64; Cd)

109-R.* Compilation and Correlation of High Temperature Catalytic Reformer Corrosion Data. G. Sorell. *Corrosion,* v. 14, Jan. 1958, p. 15t-26t.

Corrosion is attributed to small quantities of hydrogen sulphide present in the hot hydrogen-rich gas mixtures. The principal variables affecting the rate of attack are temperature and hydrogen sulphide concentration. Other factors, such as pressure, hydrogen content, time to exposure, cycling conditions and scale properties, discussed in relation to their effect on corrosion. 22 ref. (R7a)

110-R.* High-Temperature Hydrogen Sulfide Corrosion of Stainless Steels. E. B. Backensto, R. E. Drew, J. E. Prior and J. W. Sjoberg. *Corrosion,* v. 14, Jan. 1958, p. 27t-31t.

Only the austenitic steels offer satisfactory resistance to this type of attack under a wide range of conditions in the petroleum industry. Investigation covered the possible application of the new manganese-modified stainless steels; the effect of heat treatment on corrosion rate; comparison of corrosion rates of wrought, welded and cast stainless steel; tests on stress-corrosion cracking. 5 ref. (R6, R1d; SS)

111-R.* Breakaway Oxidation of Zirconium-Tin Alloys. Earl A. Gulbransen and Kenneth F. Andrew. *Corrosion,* v. 14, Jan. 1958, p. 32t.

A breakaway oxidation reaction is found for Zr-Sn alloys similar to the breakaway corrosion reaction found for steam reactions. As oxidation is a simple reaction to study, the basic breakaway phenomena may be elucidated. Data show the breakaway oxidation of Zircaloy II from 600 to 800° C. 9 ref.
(R1h; Zr, *Sn*)

112-R.* Theoretical Aspects of Corrosion in Low Water Producing Sweet Oil Wells. *Corrosion,* v. 14, Jan. 1958, p. 33t-35t.

Principal corrosive agents are hydrolytic products of inorganic salts. These salts may be deposited on metal either in the form of a thin layer or as a consolidated scale. In addition to hydrolysis of the salts, electrochemical cells are set up between the metal and the various scale constituents and thus add to the corrosion. Physical appearance of the scale and changes in physical conditions were found to affect the corrosion rate. (R6j)

113-R.* Fuel Ash Attack on Aluminum Coated Stainless Steel. J. E. Srawley. *Corrosion,* v. 14, Jan. 1958, p. 36t-38t.

Laboratory investigation of the resistance of hot dip Al coated Type 310 stainless steel to attack by residual oil ash constituents. The coated specimens did not exhibit better resistance than the uncoated steel, nor did prior heat treatment of the coated specimens have an appreciable effect. Results of a boiler test were in agreement with the laboratory finding. 7 ref.
(R7d; SS, *Al*, 8-65)

114-R.* Cavity Formation in Iron Oxide. D. W. Juenker, R. A. Meussner and C. E. Birchenall. *Corrosion,* v. 14, Jan. 1958, p. 39t-46t.

Study of the deep oxidation of Fe at high temperatures and in an oxygen atmosphere. Large cavities are always found in specimens whose total oxygen content has been brought to that of FeO. The scale thickness of such specimens, along with other evidence, implies that FeO is plastic in the temperature range in which it is stable, while one or both of the higher oxides is relatively rigid. 8 ref. (R1h; Fe)

115-R.* Corrosion and Metal Transport in Fused Sodium Hydroxide. Pt. 3. Formation of Composite Scales on Inconel. G. Pedro Smith, Mark E. Steidlitz and Eugene E. Hoffman. *Corrosion,* v. 14, Jan. 1958, p. 47t-52t.

Inconel was exposed to fused sodium hydroxide at temperatures of 450 to 815° C. and times up to 400 hr. The observed reaction was shown to consist in the selective leaching of Fe and Cr from their solid solution with Ni. The reaction product, a mixture of oxides and sodium oxysalts, was found to grow in a network of channels which, starting from the metal surface, penetrated into the bulk Inconel. 7 ref. (R6j, R2q, R2a; Ni)

116-R.* Structural Features of Corrosion of Aluminum Alloys in Water at 300° C. Kurt M. Carlsen. *Corrosion,* v. 14, Jan. 1958, p. 53t-56t.

A number of Al alloy specimens were immersed in distilled water heated to 300° C. and a study made of the structural features of corrosion. Samples were of the following general alloy types; Al-Ni, Al-Fe, Al-Ni-Fe, Al-Cu and Al-Ni-Si alloys. After exposure samples were examined by metallographic microscope. (R4a, 1-66; Al)

117-R.* Organic Corrosion Inhibitors for Iron. Robert Jenny. *Industrial Finishing (London),* v. 9, Oct. 1957, p. 872-876, 890.

Inhibition of acid corrosion of Fe by mercaptans. Study of the nature of reactions occurring between mercaptans and Fe in acid solutions; nature of organic corrosion inhibition. (R10b; Fe)

S Inspection and Control

39-S. Inspection of Electrodeposits. N. A. Tope. *Inspection Engineer,* v. 21, July-Aug. 1957, p. 74-79.

Thickness and thickness tests; "strip and weigh" method, time of gassing tests, B.N.F. jet test method, nondestructive tests, microscopic examination. (To be continued.)
(S13, S14, 8-62)

40-S.* Use of Phytic Acid in the Analytical Chemistry of Thorium. A. I. Ryabchikov, V. K. Belyaeva and A. N. Ermakov. *Journal of Analytical Chemistry of the U.S.S.R.,* v. 11, Nov-Dec. 1956, p. 705-714. (Translated by Consultants Bureau, Inc.)

Technique for quantitative determination of Th in monazite concentrates based on precipitations of Th from 6 *N* (by volume) nitric acid in the presence of oxalic acid. 56 ref. (S11j; Th)

41-S.* Organic Coprecipitants (Collectors). Pt. 7. Coprecipitation of Bismuth. Determination of Small Amounts of Bismuth in Alloys Based on Cr and Ni. V. I. Kuznetsov and L. I. Papushina. *Journal of Analytical Chemistry of the U.S.S.R.,* v. 11, Nov-Dec. 1956, p. 733-735. (Translatetd by Consultants Bureau, Inc.)

During precipitation of the sparingly soluble iodide of methyl violet, quantitative removal of any Bi contained in the solution, down to dilutions of $1{:}1{\cdot}10^8$, from the precipitate, occurs. Ni and Cr are not attracted into the precipitate. Method for determining small amounts of Bi in Cr-Ni steels, based on separation of Bi by coprecipitation with methyl violet iodide, with subsequent colorimetric determination as the iodide complex. 6 ref. (S11j; AY, *Bi*)

42-S.* Bismuthate Method for Determining Chromium in Steels Not Containing Vanadium. P. F. Agafonov. *Journal of Analytical Chemistry of the U.S.S.R.,* v. 11, Nov-Dec. 1956, p. 811-812. (Translated by Consultants Bureau, Inc.)

Simple method for rapid determination of Cr in steels via oxidation of Cr in sulphuric acid media; excess Bi is reduced directly in solution with potassium (sodium) chlorides. (S11; AY, *Cr*)

43-S. Standards for Aluminum. A. W. Halford. *Standards Engineering,* v. 9, Aug-Sept. 1957, p. 4-6.

Development of Al alloy designations; national and international standardization of light metal specifications; pernicious effect of proprietary customer specifications. (S22; Al)

44-S. Determination of Nitrogen in Zirconium. E. L. Shirley and G. R. Smith. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission*, KAPL-M-ELS-4, June 6, 1956, 5 p. (CMA)
(S11a; *N*, Zr)

45-S. Analysis of Samarium Oxide in 304 Stainless Steel-Samarium Oxide Cermets. V. F. Consalvo and J. Rynasiewicz. Knolls Atomic Power Laboratory. *U. S. Atomic Energy Commission*, KAPL-M-VFC-1, June 14, 1956, 6 p. (CMA)
(S11; *Sm*, SS; 6-70)

46-S. Determination of Nitrogen in Zirconium and Zirconium-Base Alloys. G. J. Harter, A. W. Perrine and J. F. Rodgers. Westinghouse Atomic Power Division. *U. S. Atomic Energy Commission*, WAPD-CTA(GLA)-170, Apr. 18, 1957, 6 p. (CMA)
(S11a; *N*, Zr)

47-S. A Spectrophotometric Investigation of Vanadium (V) Species in Alkaline Solutions. Leonard Newman, et al. National Lead Co. *U. S. Atomic Energy Commission*, WIN-55, June 10, 1957, 41 p. (CMA)

Fundamental quantitative data on the mechanism by which V interacts with U in alkaline carbonate solutions. Such information is important for an understanding of the precipitation of U and V from leach liquor. 34 ref. (S11k, C19n; U, V)

48-S. (German.) **Determination of Antimony in Ores and Concentrates.** J. Dolezal and P. Beran. *Czechoslovak Chemical Communication, Collection*, v. 22, June 1957, p. 727-731.
7 ref. (S11m; Sb, *Cu, Bi*, RM-n)

49-S. (German.) **Standardization of Thin Plates.** G. Oehler. *Feinwerk Technik*, v. 61, Aug. 1957, p. 280-286.

Various proposals for changes in German standards for thin plates. (S22, 4-53)

50-S. (German.) **Rapid Method for Determination of Cr_2O_3 and SiO_2 in Chromium Ores.** H. Sövegjatro. *Radex Rundschau*, no. 4, July 1957, p. 668.
(S11b; Cr, RM-n)

51-S. (German.) **Relation Between Specific Weight and Chemical Composition of Chromium Ores.** F. Trojer. *Radex Rundschau*, no. 4, July 1957, p. 671-672.
(S11b; Cr, RM-n)

52-S. (German.) **Determination of Gases in Metals With Special Consideration of Hydrogen in Aluminum.** F. Rabner. *Schweizer Archiv*, v. 23, Aug. 1957, p. 243-248.

Historical and modern methods and equipment. 32 ref. (S11r; Al, *H*)

53-S. (German.) **Measurement of Mechanical Tension in an Elastic Field by Means of the Magneto-Elastic Effect.** Gotthold Bubenzer. *VDI Zeitschrift*, v. 99, Sept. 1, 1957, p. 1215-1217.

Testing of a continuously welded rail. (S13h, T23q; ST)

54-S. (German.) **Inspection With X-Ray Image Intensifier.** Gerhard Lang. *VDI Zeitschrift*, v. 99, Sept. 1, 1957, p. 1227-1231.

Examination of very thick workpieces is possible where regular luminescent screen is not applicable. Picture brightness during X-ray of steel sheets is sufficient for a TV telecast. 4 ref. (S13e, X8g; ST)

55-S. (Japanese.) **Photometric Determination of Small Amounts of Nickel in Ores.** Kiyoshi Isono. *Japan Analyst*, v. 6, Sept. 1957, p. 557-561.
(S11a; Ni, RM-n)

56-S.* (Spanish.) **Determination of Small Amounts of Germanium.** A. Fernandez Segura, A. A. Garmendia and E. L. Pella. *Asociacion Quimica de la Argentina, Anales*, v. 45, June 1957, p. 126-135.

Method for quantitative determination of Ge in the range between 10 and 30 gammas per liter, in an approximate 2*N* zinc sulphate solution. 13 ref. (S11; Ge)

57-S.* (Portuguese.) **Study on the Quality of Steel Elevator Cables.** Karl Ehrenberg. *ABM, Associacao Brasileira de Metais, Boletim*, v. 13, July 1957, p. 267-282.

Studies made at plant of Elevadores Atlas, S. A., on samples of cable supplied by European, North American and Brazilian manufacturers. "Life tests" were carried out in test tower under simulated operating conditions to determine characteristics necessary to satisfactory length of service.
(S21, T7g; ST)

58-S.* Ultrasonic Testing of Aluminum Alloys. William L. Fink. *ASTM Bulletin*, no. 226, Dec. 1957, p. 36-42.

Acceptance standards should be based on a zoning principle that requires the most rigid standards for the extremely small critical regions in which there are high stress concentrations and in which the plane of the discontinuity lies perpendicular to the direction of loading.
(S13g; Al)

59-S. An Investigation of a Method for the Combined Determination of Niobium and Tantalum in Steel. *Iron and Steel Institute, Journal*, v. 187, Dec. 1957, p. 341-343.

Procedure provides for the presence of W, Ti and Mo and by a slight adjustment of conditions, the W precipitate could be made quantitative and simultaneous determination made. (S19j; ST, *Cb, Ta*)

60-S. (Czech.) **Standardization of Metallurgical Installations and Construction.** Josef Kopechy. *Hutnické Listy*, v. 12, Oct. 1957, p. 865-877.
4 ref. (S22)

61-S. (Czech.) **Furnace Standardization.** Rudolf Bures. *Hutnické Listy*, v. 12, Oct. 1957, p. 883-887.

Standards for oil and gas-fired furnaces. (S22, 1-55)

62-S. (English.) **Spectrographic Determination of Microamounts of Arsenic, Antimony, Bismuth, Tin and Lead.** Yu Yokoyama. *Tohoku University, Science Reports of the Research Institutes*, v. 9, Oct. 1957, p. 419-425.
3 ref. (S11k; As, Sb, Bi, Sn, Pb)

63-S. (German.) **Acceptance Testing of Materials.** Rudolf Schinn. *Stahl und Eisen*, v. 77, Nov. 14, 1957, p. 1674-1686.

Relation between specification, testing and acceptance. Description of tests. 16 ref. (S22, S13; ST)

64-S. (German.) **Microscopic Examination of Impregnated Porous Minerals.** Josef Cloth. *Stahl und Eisen*, v. 77, Nov. 14, 1957, p. 1691-1692.
(S11e; RM-n)

65-S. (Japanese.) **Segregation in Castings. Report No. 6.** Kazuo Yasuda. *Casting Institute of Japan, Journal*, v. 29, Sept. 1957, p. 648-656.

Spectrographic study. 4 ref. (S11k, 5-60, 9-69)

66-S.* (Russian.) **Service of P-65 Rails in Railroad Tracks.** N. P. Kondakov. *Stal'*, v. 17, Aug. 1957, p. 722-724.

Results of five-year field test of heavy rails. Analysis of defects. High percentage of rail replacement was due to poor mechanical processing in manufacture of the rails. 3 ref. (S21, S13, T23q; ST)

67-S. (Russian.) **Pure Metal Analysis. Determination of Arsenic.** V. A. Nazarenko, G. V. Flyantikova and N. V. Lebedeva. *Zavodskaya Laboratoria*, v. 23, Aug. 1957, p. 891-896.

Determination of As in pure Sb, Cb, V, Si, Ga and Tl. 5 ref. (S11j; *As*, Sb, Cb, V, Si, Ga, Tl)

68-S. (Russian.) **Comparative Evaluation of Gas Determination Methods in Steel.** Yu. A. Klachko, L. L. Kunin and E. M. Chistyakova. *Zavodskaya Laboratoria*, v. 23, Aug. 1957, p. 905-907.
(S11r; ST)

69-S. (Russian.) **Chromoxan, Pure Blue "B" as a Reagent for Aluminum.** F. R. Sheryanova and V. P. Malenskaya. *Zavodskaya Laboratoria*, v. 23, Aug. 1957, p. 907-909.

A new, more sensitive photocolorimetric method of aluminum determination. 5 ref. (S11a; Al)

70-S. (Russian.) **Accelerated Method of Blast Furnace Slag Analysis.** P. I. Protsenko. *Zavodskaya Laboratoria*, v. 23, Aug. 1957, p. 911-912.

Complete analysis in 20 min. (S11j; RM-q)

71-S. (Russian.) **Application of Photometric Method to Investigation of Steel Cracks.** E. N. Krasilshchikov and E. N. Shvach. *Zavodskaya Laboratoria*, v. 23, Aug. 1957, p. 959-961.
(S13d, 9-22; ST)

72-S. Electrochemical Marking of Metal. Ralph A. Botoran. *Machinery*, v. 91, Oct. 11, 1957, p. 861-862.

Advantages and techniques. (S10a)

73-S. Photometric Determination of Tungsten in Steel and Titanium Alloys With Dithiol. Lawrence A. Machlan and John L. Hague. *National Bureau of Standards, Journal of Research*, v. 59, Dec. 1957, p. 415-420.

Method provides accuracy of 0.005% W, or better, in range of 0.05 to 0.50% W, and of about 0.001% for amounts of less than 0.05% W. (S11a; *W*, ST, Ti)

74-S. Sparking Characteristics and Safety Hazards of Metallic Materials. H. Bernstein. U. S. Naval Gun Factory. *U. S. Office of Technical Services*, PB 131131, Apr. 1957, 36 p. $1.

Fundamentals of sparking theory and methods of spark testing. (S10n, A7)

75-S. Use of Ultrasound for Study of the Structure of Steels. L. G. Merkulov. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, no. 6, 1957, p. 1387-1391. (Henry Brutcher Translation no. 4057, Altadena, Calif.)

Testing large steel components for completeness of through-hardening; determination of the mean grain size; testing forgings for quality. (S13g; ST)

76-S. (Russian.) **Application of Electrolytically Obtained Permanganate Ion in Coulometric Titration.** O. A. Songina, N. G. Kemeleva and M. T. Kozlovskii. *Zavodskaya Laboratoria*, v. 23, Aug. 1957, p. 896-900.
8 ref. (S11j; Fe, Mn)

77-S. (Russian.) **Separation of Molybdenum From Iron, Aluminum and Calcium by Means of Ion-Exchanging Resins.** Yu. V. Morachevskii and M. N. Gordeeva. *Zavodskaya Laboratoria*,

v. 23, Sept. 1957, p. 1066-1067. 5 ref. (S11f; Mo, Al, Fe)

78-S. (Russian.) **Separation of Gallium From Lead and Cadmium Applying Ion Exchange Method.** E. P. Tsintsevich and G. E. Nazarova. *Zavodskaya Laboratoria,* v. 23, Sept. 1957, p. 1068-1070.

7 ref. (S11f; Ga, Pb, Cd)

79-S. (Russian.) **Measuring Surface Finish of Parts Made of Soft Alloys by Induction Profile Meter.** V. M. Kiselev. *Stanki i Instrument,* v. 28, Sept. 1957, p. 35-37.

(S15c)

80-S. (Pamphlet.) **Steel Products Manual: Carbon Steel Sheets.** 68 p. Nov. 1957. American Iron and Steel Institute, 150 East 42nd St., New York 17, N. Y.

Description of grades and qualities of carbon steel sheets to aid the purchaser in selecting the proper steel for a given use.
(S22, 15-70; CN, 4-53)

81-S. (Pamphlet.) **Tentative Specifications for Copper and Copper-Alloy Arc-Welding Electrodes. ASTM Designation B22-57T, AWS Designation A 5.6-57T.** 1957. American Welding Society, 33 W. 39th St., New York 18, N. Y. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 11 p. $.40.

For the first time two types of stranded aluminum-bronze electrodes (ECuAl-A2 and ECuAl-B) and one type of aluminum-bronze electrode (ECuAl-A2) for use with the submerged arc process are covered.
(S22, 15-68, W29h; Cu, Al)

82-S. (Pamphlet.) **Tentative Specifications for Copper and Copper-Alloy Welding Rods. ASTM Designation B259-57T, AWS Designation A 5.7-57T.** 2nd Ed. American Welding Society, 33 W. 39th St., New York 18, N. Y. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 13 p. $.40.

(S22, 15-68, W29h; Cu)

T — Metal Products and Parts

33-T. **Stainless Steel in Aromatics Production.** Richard E. Paret. *American Perfumer,* v. 70, Sept. 1957, p. 56, 58.

Excellent cleanability, great strength, high resistance to attack of acids, chemicals and to corrosion make stainless steel virtually indispensable in manufacture of soaps, perfumes and other fragrance products. (T29, 17-57; SS)

34-T. **Niobium as a Nuclear Metal.** M. J. Cotter. *Atomics and Nuclear Energy,* v. 8, Sept. 1957, p. 339-342.

Resources, discovery, separation of Cb, preparation of metal, chemistry, prices, metallurgical aspects, importance in nuclear applications, fabrication, compatibility with U. 7 ref. (T11, 17-57, A general; Cb)

35-T. **Tough Home-Made Tools From Scrap Steel and Stellite.** S. J. Meno. *Canadian Machinery,* v. 68, Sept. 1957, p. 113.

How to make cutters which bridge the gap between carbide and high speed steel. (T6n, 17-57; ST, SS)

36-T. **Steel Speeds Supersonic Flight.** *Canadian Machinery,* v. 68, Sept. 1957, p. 124-128, 196-202.

17-7 PH, 17-4 PH, and AM-350 steels, their mechanical and physical characteristics and heat treating. (T24a, 17-57; SS)

37-T. **Huge U. S. Senate Annex Roofed With Copper.** Lawrence E. Gichner. *Heating and Air Conditioning Contractor,* v. 48, Sept. 1957, p. 58-61.

Twenty-ounce hard Cu was used in one of year's largest Cu roofing jobs. Design and on-job fabrication details. (T26n, 17-57; Cu)

38-T.* **Motor Makers Discuss Aircraft Construction.** J. L. McCloud. *Metal Progress,* v. 72, Dec. 1957, p. 77-81.

With the advent of strong sheet steels for airplane structures, dimensional tolerances, their machining, bonding and plating introduce new problems. Electrolytic grinding and milling, as well as metallizing in vacuum, are interesting and important innovations.
(T24a, G24, K12, L17, L23, 17-57)

39-T. **Reactor Materials.** D. O. Luser. *Nucleonics,* v. 15, Sept. 1957, p. 137-139.

Problems of thermal, radiation and corrosion stability of reactor materials. (T11, 17-57)

40-T.* **Ceramic-Oxide Cutting Tools.** R. M. Gill. *Machinery,* v. 91, Dec. 6, 1957, p. 1341-1346.

Chemical and physical properties of ceramic oxide tools; advantages of ceramic oxide tooling; recommendations for use; typical test results. (T6n, G17, 17-57; 6-70)

41-T.* **Mechanical Tubing.** Jack C. Merriam. *Materials in Design Engineering,* v. 46, Dec. 1957, p. 127-146.

Types and shapes of mechanical tubing available, working and fabrication and some typical applications. Principal characteristics of the tubing materials: carbon and alloy steels; stainless steels; Cu, Ni, Al, Mg, Ti and specialty alloys.
(T7, 17-57; 4-60)

42-T.* **Mechanical Springs — Materials, Finishes and Embrittlement.** Lester F. Spencer. *Metal Finishing,* v. 55, Dec. 1957, p. 56-60.

Nominal composition of spring materials including carbon and alloy steels, Cu and Ni-base alloys, and precipitation hardening stainless; protective coatings—Cd and Zn plate; salt spray resistance; embrittlement. (To be continued.)
(T7c, 17-57; CN, AY, SS, Ni, Cu)

43-T. **Automobile Instrumentation.** Pt. 2. *Metal Industry,* v. 91, Nov. 8, 1957, p. 395-396.

Use of die castings.
(T21c, 17-57; 5-61)

44-T.* **Materials and Processes for the Hot Airplane.** H. B. Sipple and G. G. Wald. *Steel Processing and Conversion,* v. 43, Dec. 1957, p. 679-685.

Temperature problem associated with aerodynamic heating; definition of the structural problem; comparison of structural materials from point of view of effect of temperature on properties; fabricating and processing problems.
(T24, 17-57; SGA-h)

45-T.* **Metallic Material Engineering and Manufacturing Aspects of New High-Speed Aircraft.** E. A. Simkovich. *Steel Processing and Conversion,* v. 43, Dec. 1957, p. 686-690.

Certain trends are becoming increasingly apparent: Ti alloys (particularly those responsive to heat treatment) plus the new die steels will adequately cover the range of 250-1000° F. in airframes. Other steel sheet alloys, such as AM350, 15-7Mo, 17-7PH, 422 or 422 modified, will also fill specific requirements in this regime. For temperatures above 1000° F. airframes will probably follow engine trends and utilize the superalloys to a great extent.
(T24a, 17-57, SGA-h)

46-T. **Canadian Landing Gear Uses 260,000 Tensile Steel.** G. F. W. McCaffrey. *Canadian Metalworking,* v. 20, Oct. 1957, p. 8-12.

Landing gear was machined from modified SAE 4340 steel and heat treated in neutral salt bath followed by oil quenching and double tempering to give tensile strength of 260,000 psi. (T24, G17, J26; AY)

47-T. **Galvanized Structural Steel in Gulf Coast Construction.** *Industrial and Engineering Chemistry,* v. 49, Dec. 9, 1957, p. 69A-70A.

Celanese's experience at Bishop, Tex., has led to the use of galvanized, rather than painted, steel in its new, low-pressure polyethylene plant. 4 ref.
(T26n, 17-57; ST, *Zn*, 8-65)

48-T. **Use of Magnesium in Future Aircraft and Missile Structures.** John H. Rizley and Robert E. Mihalco. *Light Metal Age,* v. 15, Dec. 1957, p. 24-27.

(T24, 17-57; Mg)

49-T. **How Will We Shape the New Materials?** Alfred H. Petersen. *Machine and Tool Blue Book,* v. 52, Dec. 1957, p. 113-124.

Problems in replacing Al with high-strength steel and Ti alloys for framework of aircraft.
(T24a; Ti, Al, SS)

50-T. **Machining Pontiac's New Steering Knuckle.** Lewis B. Arscott. *Machinery,* v. 64, Dec. 1957, p. 130-135.

Knuckles are forged from SAE 1345 steel. After inspection, forgings are heated to 1550° F. in a continuous gas-fired furnace, quenched in oil and drawn to produce a Brinell hardness of 241 to 286.
(T21c, F22, J26; CN)

51-T. **Ford Speeds Output of Needle Bearings.** *Machinery,* v. 64, Dec. 1957, p. 136-143.

(T7d; ST)

52-T. **How Auto-Lite Produces 1958 Bumpers.** Charles Starzman. *Machinery,* v. 64, Dec. 1957, p. 174-179.

Polishing, phosphatizing, pressing, automatic cleaning, Ni and Cr plating and rinsing of high-tensile steel sheet.
(T21c, L general; ST, SGB-a, *Ni, Cr*)

53-T. **New Chevrolet Transmission Plant Now in High Gear.** Edgar Altholz. *Machinery,* v. 64, Dec. 1957, p. 180-187.

Die-casting, forging, machining, forming and welding. Die-caster used is largest in automotive industry. (T21c, E13, 1-52, G general, Al)

54-T. **Automatic Factories—Britain Has One, Too.** Peter Trippe. *Metalworking Production,* v. 101, Nov. 1, 1957, p. 1973-1977.

Layout and operations in British roller bearing plant. (T7d, 18-74)

55-T. **Chance Vought Uses More Steel Castings.** *Modern Castings,* v. 33, Jan. 1958, p. 26-28.

(T24, 17-57; ST, 5-60)

56-T. **Howard Foundry Builds Quality Into Aircraft Castings.** Charles F. Maxwell. *Modern Castings,* v. 32, Jan. 1958, p. 32-36.

Al and Mg foundry practice.
(T24, E general, 17-57; Al, Mg)

57-T. **Automotive Gray Cast Iron.** D. L. Watson. *Canadian Metalworking,* v. 20, Nov. 1957, p. 42-46.

(T21, 17-57, 2-60; CI-r)

58-T. **New Alloy for Reactor Control.** *Chemical and Engineering News,* v. 36, Jan. 6, 1958, p. 56.

Control rod alloy of Ag, Cd and In that's cheaper than Hf. (T11j, 17-57; Ag, In, Cd)

59-T. What's Ahead for Aluminum in Autos. H. F. Barr. *Modern Metals,* v. 13, Oct. 1957, p. 31-42.

Use of Al in Chevrolet's automatic transmission case and fuel injection system. Predicts increases in Al use by automobile industry. (T21, 17-57; Al)

60-T. Ultra-Lightweight Aluminum Foam. *Modern Metals,* v. 13, Oct. 1957, p. 68-70.

Note on production and properties of Al foam. (T10, 17-57; Al)

61-T. (Italian.) **Packing Materials as a Factor in the Preservation of Fresh Fish.** M. Gualtieri. *Alluminio,* v. 26, Nov. 1957, p. 469-571.

At room temperature as well as under refrigeration, common mackeral and horse mackerel were found to keep better longer in Al containers than in wooden. 4 ref. (T10g, T29p, 17-57, Al)

62-T. (Italian.) **Contribution of Nickel to the Progress of the Chemical Industry.** *Nickel,* no. 70, Oct. 1957, p. 15-19.

Applications of Ni in equipment for production and handling of synthetic resins, pharmaceuticals, insecticides, etc., resistance of Ni to atmospheric attack and to corrosion by water, salts, acids, gases, alkalis. (T29, R general, 17-57; Ni)

63-T. (Russian.) **Zinc Alloy Guides on Heavy Machine Tools.** Yu. N. Sychev. *Stanki i Instrument,* v. 28, Sept. 1957, p. 39-40.

(T6n, 15-57; Zn)

W Plant Equipment

44-W.* Walking Beam Furnaces. K. Roney. *Electrical Review,* v. 161, Sept. 6, 1957, p. 403-407.

Electric furnaces for all types of heat treatment of heavy or bulky parts have system of moving hearth beams. (W27)

45-W. Hydraulic Equipment in Steelworks. Pt. 4. Modern Pumps and Motors. F. B. Levetus. *Iron and Coal Trades Review,* v. 175, Aug. 30, 1957, p. 494-496.

(W13d, W11q)

46-W. (German.) **High-Frequency-Heating for Surface Hardening, Local Annealing and Brazing.** F. L. Gladivin. *Elektrowärme,* v. 15, Aug. 1957.

(W27k, W29n)

47-W. (German.) **Cast Iron in the Construction of Machine Tools.** Ernst Schultz. *Industrie Anzeiger,* v. 79, Aug. 16, 1957, p. 987-990.

(W25, 17-57; CI)

48-W. (German.) **All-Basic Openhearth Furnace.** R. P. Heuer and M. A. Fay. *Radex Rundschau,* no. 4, July 1957, p. 601-654.

Historical review; present practice; future possibilities. 137 ref. (W18r, D2; ST)

49-W. (German.) **Steam Turbines for High Temperature and Pressure. General Material and Construction Problems. Pt. 2.** Carl Brennecke and Rudolph Schinn. *VDI Zeitschrift,* v. 99, Sept. 1, 1957, p. 1233-1244.

23 ref. (W11k, 17-57; ST, SS)

50-W. Making a Forging-Ingot Mould With Skeleton Pattern. F. H. Gartland. *British Foundryman,* v. 50, Nov. 1957, p. 560-562.

(W19c, 17-57; CI)

51-W. (Czech.) **Basic Lining of Electric-Arc Furnaces Producing Low-Carbon Steels.** Jaroslav Dobry. *Hutnicke Listy,* v. 12, Oct. 1957, p. 907-913.

12 ref. (W17j; CN-g)

52-W. (German.) **Cupola Furnace Charging Column Level Measurement by Gamma Radiology.** Alfred Rexroth. *Giesserei,* v. 44, Nov. 7, 1957, p. 695-696.

(W18d, S18q)

53-W. (German.) **Load and Mode of Operation of the Electric Drive in Blooming Mills. Pt. 3.** Werner Nurnberg. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1593-1607.

5 ref. (W23a, W23n; 4-52; ST)

54-W. (German.) **Control and Regulation of the Twin Drive of a Plate Rolling Mill.** Otto Martin. *Stahl und Eisen,* v. 77, Oct. 31, 1957, p. 1607-1610.

6 ref. (W23b, W23n, 4-53; ST)

55-W. (Russian.) **Sintering Plant Dust Removal Apparatus.** A. V. Sheleketin and N. S. Karpushinskii. *Metallurg,* v. 2, Aug. 1957, p. 10-12.

(W13c, B15)

56-W. (Russian.) **Perfection of Openhearth Furnace Head.** A. P. Klyucherov and L. V. Makogonov. *Metallurg,* v. 2, Aug. 1957, p. 26-27.

(W18r, 17-51)

57-W. Heating Unit Debonds and Blues Rotors for Electric Motors. *Industrial Heating,* v. 11, Nov. 1957, p. 2298.

Gas-fired rotary heating unit speeds production to 400 units per hr. (W28r, L14; ST)

58-W. Detroit Steel's New Furnace Installation for Bright Annealing of Cold Rolled Strip. *Industrial Heating,* v. 11, Nov. 1957, p. 2313-2316.

(W27, J23a; ST, 4-53)

59-W. Welding Vs. Melting. R. G. LeTourneau. *Machine and Tool Blue Book,* v. 52, Dec. 1957, p. 134-138.

Tourna melting machine, similar to a squirt welder, greatly increases production. (W29, 1-52; ST)

60-W. Vapour Blasting Equipment for Integrally-Stiffened Wing Panels. R. Furgeson and J. R. Eggum. *Machinery,* v. 91, Oct. 18, 1957, p. 918-919.

Equipment for automatic deburring and blending of wing panels by means of vapor blasting. (W2r, L10c, T21a; Al)

61-W. Heat Checking in Die Casting Dies. H. K. Barton. *Machinery,* v. 91, Oct. 25, 1957, p. 982-990.

Mechanism of heat checking and its influence on serviceability of die casting dies. Design precautions. (W19n, 9-22; ST)

62-W. Plating Hoover Steam-or-Dry Irons. *Product Finishing (London),* v. 10, Nov. 1957, p. 83-86.

Floor plan and operating details of automatic plating machine installed at High Wycombe factory. (W10a, L17, 1-52; *Cu, Ni, Cr)*

63-W. Silicon Rectifiers Improve Features of D-C. Welders. E. F. Steinert. *Welding Engineer,* v. 43, Jan. 1958, p. 38.

(W29a, 1-52)

64-W.* Safeguards Aspects of Reactor Vessel Design. D. R. Miller and W. E. Copper. *Welding Journal,* v. 37, Jan. 1958, p. 22s-26s.

Internal heat generation in structural materials, radiation-induced changes in mechanical properties, thermal shock and strain cycling, and coolant-dissociation effects on corrosion and embrittlement, all present problems which require close attention. 12 ref. (W11p, 17-57)

65-W. Rotary Retort Furnace Duplex Quench Improves Case Hardening of Fasteners. William Schmidt. *Western Metals,* v. 15, Oct. 1957, p. 43-45.

(W27g, J28, T7f; CN, AY, SS)

66-W. Effect of Process Variables Upon the Design of Centrifugal Pipe Casting Machines. A. A. Mikhel'son. *Stal',* v. 16, no. 4, 1956, p. 348-351. (Henry Brutcher Translation no. 4016, Altadena, Calif.)

Design governed by action of liquid metal on principal parts of centrifugal pipe-casting machine. (W19, E14; 17-51, 4-60)

67-W. Pipe Maker Installs Water-Cooled Cupola. J. H. Rehder. *Canadian Metalworking,* v. 20, Nov. 1957, p. 30-36, 69.

(W18d, E10a, 1-55; CI)

68-W. Semi-Continuous Casting Made Easy. *Canadian Metalworking,* v. 20, Nov. 1957, p. 50-52.

Simple machine, replacing hydraulic system of casting, may bring continuous casting of nonferrous slabs and billets into wider use. (W19f, C5q, 4-52; Al, Mg)

69-W. Convector Oven or Infra-Red Radiation? M. Reeves. *Industrial Finishing (London),* v. 9, Oct. 1957, p. 852-857.

Conveyor-type ovens for baking and drying metal finishes; compares relative merits of convection and infra-red radiation. (W4k)

70-W. Mechanical Presses. Their Selection, Design, and Function. Pt. 1. *Modern Industrial Press,* v. 19, Oct. 1957, p. 43-50.

Procedure for determining correct size, capacity and operating speeds of a press. Difference between single and double presses and type of stamping each is suited to. (To be continued.) (W24g)

71-W. (Russian.) **The Leningrad Stalin Metal Plant.** A. I. Chizhik. *Metallovedenie i Obrabotka Metallov,* no. 11, Nov. 1957, p. 66-71.

Parts for steam turbines are made. 27 ref. (W10; W11k; ST)

72-W. (Russian.) **Investigation of Performance of Blast Furnace Shaft Carbon Lining.** F. A. Khilkevich and S. V. Bazilevich. *Stal',* v. 17, Sept. 1957, p. 769-771.

Carbon lining lasts longer than fireclay lining and heat losses remain the same. (W17g; RM-h39)

73-W.* (Russian.) **Application of Electric Integrator in Investigation of Temperature Distribution in Blast Furnace Hearth Bottom and Foundation.** V. V. Yushkin. *Stal',* v. 17, Sept. 1957, p. 779-787.

Most efficient drop of temperature of interior surface of the foundation was obtained for fireclay lining spread over carbon lining with resulting low penetration rate of the liquid pig iron. 4 ref. (W17g, D1; RM-h)

74-W. (Russian.) **Application of Unburnt Magnesite-Chromite Bricks in Openhearth Furnace Roofs.** M. Broit. *Stal',* v. 17, Sept. 1957, p. 792-795.

Openhearth furnace roofs made of unburnt magnesite-chromite bricks last at least twice as long as silica brick roofs. 3 ref. (W18r; RM-h)

75-W. (Russian.) **Development of Cracks in Ingot Molds.** N. I. Pavlovtseva and L. M. Cherkasov. *Stal',* v. 17, Sept. 1957, p. 800-804.

(*Continued on p.* 66)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

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SUPERVISOR, FABRICATION DEVELOPMENT . . . to direct development of duplex structures by extrusion, rolling, or pressing. Cladding studies, development and preparation of cermets. B. S. or M. S. with strong background and at least six years in relevant work required or Ph. D. with two or three years of experience.

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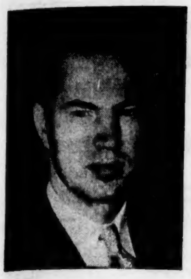

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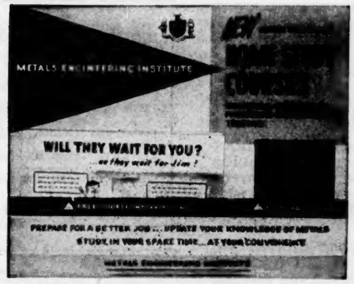

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Review of Metal Literature

(*Continued from p.* 58)

Considerable decrease of number of cracks in cast iron ingot molds can be obtained by modification of the cast iron with Cr or Mg. 3 ref. (W19c, 17-57, 9-72; CI, *Cr, Mg*)

76-W. (Book.) **Conference on Atomic Energy in Industry,** v. 5, 202 p. 1957. National Industrial Conference Board, Inc., 460 Park Ave., New York 22, N. Y. $15.

Metallurgical articles abstracted separately. (W11p, T11, 17-57)

X Instrumentation

Laboratory and Control Equipment

13-X. (Russian.) **Apparatus for Exact Determination of Electrical Resistance of Metals and Alloys at High Temperature in Vacuum.** S. D. Gertsriken and A. V. Progrushchenko. *Zavodskaya Laboratoria,* v. 23, Aug. 1957, p. 974-975.

(X25, P15g, 2-62, 1-73)

14-X. Precision Castings Guide Radar Signals. K. L. Herrick and Samuel Lipson. *Modern Castings,* v. 33, Jan. 1958, p. 29-31, 68.

Investment castings in the manufacture of wave guide components. (X15q, 17-57; 5-62)

15-X. True Stress Vs. Elongation Recorder. D. E. Driscoll and T. S. DeSisto. Watertown Arsenal Laboratory. *U. S. Office of Technical Services,* PB 131104, July 1955, 22 p. $.75.

Electronic extensometer and recorder that will autographically record the true stress versus elongation curve. It can be used on practically all ferrous and nonferrous metals. (X29p)

16-X. High Vacuum Filament Furnace for Gas Analysis of Metals. G. A. Consolazio and W. J. McMahon. Watertown Arsenal. *U. S. Office of Technical Services,* PB 131121, Oct. 1955, 13 p. $.50.

(X24f, S11r)

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Mark those five days next May as the "Days that Pay". You'll find them just that, because thousands will be at the Dallas Metal Show, searching for production advantages that will help improve operations, services, products – and at lower costs.

These prospects will be ready to buy. They'll be "preconditioned" – for the great Southwest is on the march, sparking sales to improve its own business economy.

ASM Metal Shows are famous as sales stimulants. They are "musts" for any firm with an eye on an expanded tomorrow. Here in the Southwestern Metal Show is a rich metal market full of opportunity for the prospecting manufacturer. Here's a show that will out-draw, out-sell and surpass anything you've experienced before in the "great open spaces."

STATE FAIR PARK

DALLAS, TEXAS

MAY 12-16, 1958

Because the Show is staged in Dallas' spacious State Fair Park, only two miles from the city's center and downtown hotels, you'll be able to put your best foot forward before a top level audience looking for just what you've got to offer. There never was a finer exhibition hall – all on one level – airy, bright. It puts visitors in the right frame of mind to buy. It will be bristling with ideas and thronged with buyers.

Get your share of this new market. The Southwestern Metal Show is the place to sell! Act today – select your space. If you don't have floor plans, write us NOW. You'll reap a harvest from this new and finer Metal Show. To assure success in '58 – Don't Hesitate!

ASM Southwestern Metal Exposition

W. H. EISENMAN, *Managing Director* • CHESTER L. WELLS, *Assistant Director*

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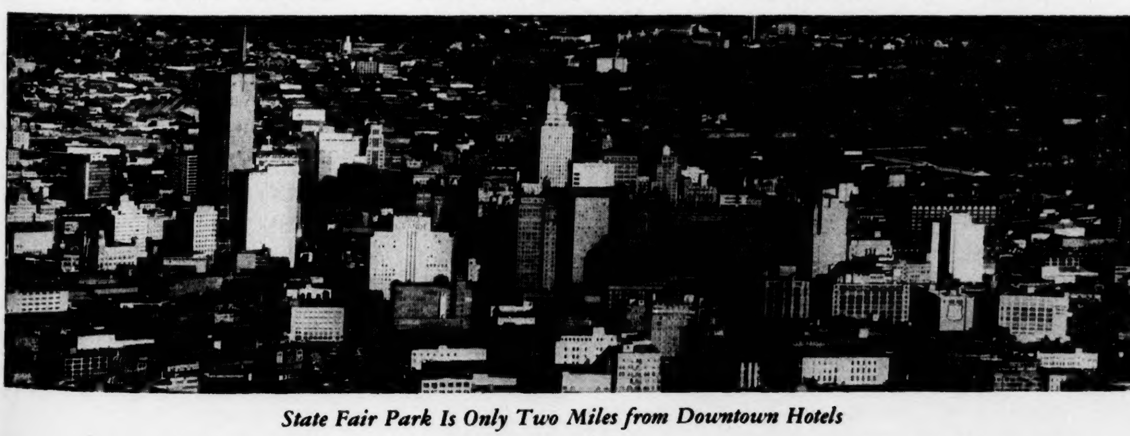

State Fair Park Is Only Two Miles from Downtown Hotels

METAL SHOWS OWNED AND OPERATED BY THE AMERICAN SOCIETY FOR METALS